Doctoral Programme in Population Health
Department of Psychology and Logopedics,
Faculty of Medicine,
University of Helsinki,
Finland

THE RELATIONSHIPS OF TEMPERAMENT, CHARACTER, AND DEPRESSIVE SYMPTOMS WITH PARANOID IDEATION

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ACADEMIC DISSERTATION

To be presented, with the permission of the Faculty of Medicine of the University of Helsinki, for public examination in Auditorium XII, University Main Building, on 13 April 2018, at 12 noon.

Helsinki 2018

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ISBN 978-951-51-4163-7 (pbk.)
ISBN 978-951-51-4164-4 (PDF)

Unigrafia
Helsinki 2018

ABSTRACT

This study investigated i) the relationship of temperament and character with paranoid ideation over age in adulthood ii) the association of explosive temperament profile with the development of character dimensions self-directedness and cooperativeness, and whether this association is modified by social support and attachment security iii) the co-occurrence of depressive symptoms with paranoid ideation from late adolescence to middle age in the general population.

The participants (n = 2028, 2137, and 2109 in Studies I–III) were selected from the prospective Cardiovascular Risk in Young Finns Study, which started in 1980. Paranoid ideation and depressive symptoms were assessed at several time points over a 20-year follow-up in 1992–2012. Temperament and character, social support, and attachment security were measured multiple times between 1997–2012. We used multilevel models for repeated measurements, which were controlled for participants' age, gender, and socioeconomic status both in childhood and adulthood.

The results revealed that single temperament dimensions of high novelty seeking, high harm avoidance and low reward dependence and also explosive temperament profile (consisting of high novelty seeking, high harm avoidance, and low reward dependence) were related to a higher level of paranoid ideation in adulthood. These associations appeared to be mediated by character dimensions. Specifically, high self-directedness, high cooperativeness, and low self-transcendence could protect individuals with temperament-related susceptibilities from paranoid ideation. Explosive temperament was associated with lower self-directedness and cooperativeness as compared to other temperaments, but high social support and secure attachment had a positive influence on character development in individuals with explosive temperaments. Additionally, we found that depressive symptoms were linked with the course of higher paranoid ideation, especially in late adolescence and early adulthood. Regarding various depressive subsymptoms, high negative attitude and high performance difficulties were associated with the course of more severe paranoid ideation over age in adulthood, whereas the influence of somatic symptoms became significant only after early adulthood. Finally, depressive symptoms appeared to be more strongly related to the development of trait- than state-level paranoid ideation.

Specific variants of single temperament dimensions and profiles represented susceptibilities for paranoid ideation. The presence of supportive and confidential relationships was linked with more mature character (i.e. higher self-directedness and higher cooperativeness), which appeared to have a protective role against paranoid ideation in individuals with risky temperaments. The co-occurrence between depressive symptoms and paranoid ideation was especially evident in late adolescence and early adulthood.

Individuals, who have temperament-related susceptibilities for paranoid ideation, might benefit from interventions, which promote the abilities to form

confidential and supportive social relationships. This might help them to internalize more mature concepts about the self and interpersonal relationships, which, in turn, could enhance the self-regulation of temperament-related susceptibilities and lower the risk for paranoid ideation. Individuals with co-occurring depressive symptoms and paranoid ideation might benefit from neurocognitive rehabilitation, social skills training, and community-based treatments in order to enhance interpersonal activities and metacognitive abilities.

TIIVISTELMÄ

Tutkimuksessa tarkasteltiin i) temperamentin ja luonteen yhteyttä paranoidiseen ajatteluun aikuisuudessa ii) eksplosiivisen temperamenttiprofiilin yhteyttä itseohjautuvuuteen ja yhteistyöhakuisuuteen, ja sosiaalisen tuen ja kiintymystyylin muokkaavaa vaikutusta tähän yhteyteen iii) masennusoireiden ja paranoidisen ajattelun yhteisvaihtelua myöhäisnuoruudesta keski-ikään saakka yleisessä väestössä.

Tutkittavat (n = 2028, 2137, ja 2109 tutkimuksissa I–III) valittiin v. 1980 alkaneen prospektiivisen Lasten Sepelvaltimotaudin Riskitekijät -tutkimuksen aineistosta. Paranoidista ajattelua ja masennusoireita mitattiin useaan kertaan 20 vuoden seurannan aikana v. 1992–2012, ja temperamentti ja luonne, sosiaalinen tuki sekä kiintymystyyli mitattiin useaan kertaan v. 1997–2012. Tutkimuksessa käytettiin pitkittäisasetelmiin soveltuvia monitasomalleja, joissa kontrolloitiin tutkittavien ikä, sukupuoli sekä sosioekonominen asema lapsuudessa ja aikuisuudessa.

Yksittäisistä temperamenttidimensioista korkea elämyshakuisuus, korkea harmin välttäminen ja matala palkintoriippuvuus sekä eksplosiivinen temperamenttiprofiili (sisältäen korkean elämyshakuisuuden, korkean harmin välttämisesen ja matalan palkintoriippuvuuden) olivat yhteydessä korkeampaan paranoidiseen ajatteluun. Luonnedimensiot vaikuttivat välittävän tätä yhteyttä. Korkea itseohjautuvuus, korkea yhteistyöhakuisuus sekä matala henkisyys suojasivat paranoidiselta ajattelulta yksilöitä, joilla oli temperamenttisidonnainen alttius paranoidisuudelle. Eksplosiivinen temperamentti oli yhteydessä matalampaan itseohjautuvuuteen ja yhteistyöhakuisuuteen kuin muut temperamenttiprofiilit, mutta korkealla sosiaalisella tuella ja turvallisella kiintymystyylillä oli positiivinen vaikutus luonteen kehittymiseen eksplosiivisen temperamentin omaavilla yksilöillä. Lisäksi havaittiin, että masennusoireet liittyivät korkeampaan paranoidiseen ajatteluun etenkin myöhäisnuoruudessa ja varhaisaikuisuudessa. Tarkasteltaessa masennuksen oireryhmiä havaittiin, että korkea negatiivinen asennoituminen sekä vakavat toimintakyvyn vaikeudet liittyivät korkeampaan paranoidiseen ajatteluun nuoruudesta keski-ikään saakka, kun taas somaattisten oireiden yhteys paranoidiseen ajatteluun ilmeni vasta varhaisaikuisuuden jälkeen. Masennusoireet näyttivät liittyvän voimakkaammin piirretason paranoidiseen ajatteluun kuin hetkellisiin paranoidisiin tiloihin.

Tietyt variantit yksittäisistä persoonallisuusdimensioista ja eksplosiivinen temperamenttiprofiili vaikuttivat ilmentävän alttiustekijöitä paranoidiselle ajattelulle. Kuitenkin supportiiviset ja luottamukselliset sosiaaliset suhteet olivat yhteydessä kypsempiin luonnepiirteisiin (eli korkeaan itseohjautuvuuteen ja korkeampaan yhteistyöhakuisuuteen), jotka puolestaan suojasivat paranoidisen ajattelun kehittymiseltä yksilöitä, joilla oli temperamenttisidonnainen riski paranoidiselle ajattelulle. Masennusoireiden yhteys paranoidiseen ajatteluun ilmeni etenkin myöhäisnuoruudessa ja varhaisaikuisuudessa.

Yksilöt, joiden temperamenttiin sisältyy alttiustekijöitä paranoidiselle ajattelulle, saattaisivat hyötyä interventioista, jotka kehittävät kykyjä muodostaa

luottamuksellisia ja supportiivisia sosiaalisia suhteita. Tällaiset interventiot voisivat auttaa heitä sisäistämään kypsemmät käsitykset itsestä ja interpersonaalisista suhteista, jotka puolestaan saattaisivat kehittää paranoidiselle ajattelulle altistavien temperamenttipiirteiden itsesäätelyä ja pienentää riskiä paranoidiselle ajattelulle. Yksilöt, joilla ilmenee samanaikaisesti masennusoireita ja paranoidista ajattelua, saattaisivat hyötyä neurokognitiivisesta kuntoutuksesta, sosiaalisten taitojen harjoituksista sekä yhteisöllisistä hoitomuodoista, jotka lisäisivät sosiaalista aktiivisuutta ja kehittäisivät metakognitiivisia taitoja.

ACKNOWLEDGEMENTS

My deepest gratitude is owed to Professor Emerita Liisa Keltikangas-Järvinen, who has been my supervisor throughout the dissertation process. The extent of her scientific knowledge is impressive. I am extremely grateful for her professional guidance how to write and publish high-quality scientific manuscripts and how to work as a part of the international research community. Moreover, I thank her for always giving me inspiring research questions and highlighting the importance of ethical principles and justice. I also value highly her helpfulness with my trivial questions and my poor manuscript drafts. Besides, I want to express my gratefulness for the funding that made this dissertation financially possible. Finally, words cannot describe how much I appreciate her unconditional support, emotional encouragement, loyalty, and practical help in my desperate moments. It has been priceless. I cannot think about that without becoming deeply touched.

Next, I wish to express my gratefulness to my supervisor Professor Mirka Hintsanen. I am extremely thankful for her substantial scientific contribution to all my manuscripts. Her professional supervision related to, for example, statistical analyses, results reporting, and participation in international conferences has been essential to me. Moreover, I want to express her my warm thanks for emotional support, faithfulness, listening my worries, and efforts toward justice. It has created so much hope in my tough times. Finally, I thank her for the financial funding that she provided for this dissertation.

I am grateful for Docent Laura Pulkki-Råback for her valuable comments to my manuscripts. I also appreciate her responsibility during the pre-examination process and her readiness to help with a variety of issues related to the use of the data.

I thank Docent Tom Rosenström and Docent Christian Hakulinen for their supervision at the beginning of the dissertation process. I am grateful also for all the other co-authors of the original publications of this thesis. Moreover, I want to express warm thanks to my great colleague Elli Oksman. Her loyalty and emotional support has meant really much to me.

I wish to thank Petrus Mikkola for his assistance in my questions related to statistical models and for his encouragement in the face of setbacks.

Finally, I am grateful for my wonderful family members for all their emotional and practical support during this process. I want to express a special gratitude for my mother Irja Saarinen, who has always encouraged me to follow my inner compass and to set my goals high.

CONTENTS

LIST OF ORIGINAL PUBLICATIONS

This thesis is based on the following publications:

I Saarinen, A., Rosenström, T., Hintsanen, M., Hakulinen, C., Pulkki-Råback, L., Lehtimäki, T., Raitakari, O., Cloninger, C. R. & Keltikangas-Järvinen, L. (2018). Longitudinal associations of temperament and character with paranoid ideation: a population-based study. *Psychiatry Research, 261*, 137–142.

II Saarinen, A., Rosenström, T., Hakulinen, C., Cloninger, C. R., Hintsanen, M., Pulkki-Råback, L., Lehtimäki, T., Raitakari, O. & Keltikangas-Järvinen, L. (2018). Longitudinal associations of explosive and adventurous temperament profiles with character development: the modifying effects of social support and attachment. *Journal of Clinical Psychiatry, 79*, 17m11587.

III Saarinen, A., Hintsanen, M., Hakulinen, C., Pulkki-Råback, L., Lehtimäki, T., Raitakari, O. & Keltikangas-Järvinen, L. (2018). The co-occurrence between depressive symptoms and paranoid ideation: a population-based longitudinal study. *Journal of Affective Disorders, 229*, 48–55.

ABBREVIATIONS

APA	American Psychiatric Association
BDI	Beck Depression Inventory
MBDI	A modified version of the Beck Depression Inventory
MLM	Multilevel model
MSPSS	Multidimensional Scale of Perceived Social Support
SCL-90-R	Symptom Checklist-90 Revised
TCI	Temperament and Character Inventory
YFS	Young Finns Study

1 INTRODUCTION

1.1 PARANOID IDEATION: CONCEPTUALIZATION

Paranoia is defined as an unjustified distrust and suspiciousness towards others such that their motives are interpreted as malevolent (American Psychological Association, APA, 2013). There is accumulating evidence that paranoia exists along a continuum in the general population, ranging from mild and subclinical paranoid ideas to severe paranoid symptoms (e.g. Freeman et al., 2005; Freeman & Garety, 2014; Van Os, 2003). The severity of paranoia can be described with regard to intensity, frequency, and degree of conviction of paranoid ideas (e.g. Freeman et al., 2005; Chan et al., 2011). Hence, mild paranoia refers to feelings of vulnerability in relation to others, such as fears about others' critical attitudes toward the self (Freeman & Garety, 2014). Such mild paranoid feelings may appear and disappear along with situations factors, and one may be uncertain about the content of paranoid ideas. Instead, severe paranoia includes beliefs that others are deliberately trying to cause significant harm to the self (Freeman & Garety, 2014). If these beliefs become persistent and distressing and an individual is convinced about them, they can be diagnosed as paranoid personality disorder (APA, 2013). In the most severe end of the paranoia continuum, paranoid symptoms may even reach the level of psychosis and be manifested as persecutory delusions that involve beliefs that, for example, public authorities have conspiracies against the self (Johns & Van Os, 2001; Van Os, 2003; Verdoux & Van Os, 2002). Persecutory delusions are the core feature of the persecutory subtype of delusional disorder (APA, 2013).

This continuum-based viewpoint on paranoid ideation is in line with the staging model for psychiatric symptoms, developed by McGorry et al. (2006, 2007). On the basis of the staging model (McGorry et al., 2006), each individual can be placed at one point on the paranoia continuum. Importantly, each individual may also proceed toward the milder or more severe end of the continuum over time. Hence, a progression from mild paranoid ideas to diagnostically significant paranoid symptoms is by no means inevitable. Instead, several individuals who reach a subclinical stage of paranoia may never progress to a more severe stage of paranoia. This staging model provides novel possibilities to improve the content and timing of interventions for paranoid ideation. Specifically, a clinician may identify one's current stage of paranoid ideation and select such an intervention that might prevent one's progression toward more severe stages of paranoia (McGorry et al., 2006).

In a wider context of psychopathology, paranoid ideation can in some cases be a part of psychotic symptomatology. Previously, factor analytic studies have demonstrated that the symptoms of schizophrenia and other psychotic disorders include several dimensions, such as positive symptoms (i.e. sensory hallucinations, delusions), negative symptoms (i.e. affective flattening, alogia, avolition, anhedonia), and disorganized symptoms (i.e. formal thought disorder, disorganized behavior,

inappropriate affect) (e.g. Flaum et al., 1995; O'Leary et al., 2000; Serretti & Olgiati, 2004). Hence, among patients with schizophrenia or certain other psychotic disorder, persecutory delusions may represent one symptom dimension of their illness. Importantly, however, paranoid ideation may not necessarily be linked with any psychotic disorder, for example, in the context of subclinical paranoid ideation or paranoid personality disorder. Taken together, paranoid ideation comprises an independent symptom dimension that may not necessarily be linked with any psychotic disorder.

The lifetime prevalence of psychotic-level persecutory delusions is approximately 5–8% (Freeman & Freeman, 2008; Mohr et al., 2008; Rutten et al., 2008). The prevalence of mild paranoid ideas is substantially higher, although there is also considerable cultural variation in the prevalence of paranoid ideation. For example, thoughts about negative comments being circulated about the self or thoughts that one needs to be on guard against others, occur weekly in about 10% of the Chinese population (Chan et al., 2011) but even in 40% of the individuals in the US (Freeman et al., 2005). One study suggested that in Finland and some other European countries the average rate of paranoid ideation is even higher than in the US (Olsen et al., 2006). Despite this, however, paranoid personality disorder is diagnosed in approximately 4–5% of the individuals in the US (Crawford et al., 2005; Grant et al., 2004), but only in 1–2% in European countries (Samuels et al., 2002; Coid et al., 2006; Torgersen et al, 2001). Hence, there may exist national differences also in the diagnostics of paranoid ideation.

Paranoia is linked with considerable societal disadvantages. Paranoid symptoms, even those at the subclinical level, are associated with a wide variety of somatic health complaints, such as sleep disturbances, obesity, diabetes, and cardiovascular disorders (Coid et al., 2016; Freeman et al., 2011; Johnson et al., 2000; Nestor, 2002). Paranoid symptoms also correlate with a range of other psychiatric symptoms, such as depression, anxiety, post-traumatic stress disorder, substance abuse, and even suicidality (Alsawy et al., 2015; Chen et al., 2003; Freeman et al., 2011). Furthermore, severe paranoid symptoms are found to be a risk factor for conducting serious violent crimes (Belfrage, 1998; Heinrichs & Sam, 2012; Swanson et al., 1996). Subsequently, patients with paranoid symptoms have a heightened need for a range of public healthcare services (Vaughn et al., 2010).

1.2 THE PSYCHOLOGICAL ETIOLOGY OF PARANOID IDEATION

Despite the considerable societal disadvantages related to paranoia, the understanding of the psychological etiology of paranoid ideation has remained limited. Firstly, it has been found that paranoid ideation is associated with an aversive psychosocial environment. There is evidence that physical attack, sexual abuse, bullying, hearing defect, and drug-induced hallucinations are associated with higher paranoid features (D'Souza et al., 2004; Freeman & Fowler, 2009; Gracie et al., 2007; Lopes, 2013; Thewissen et al., 2005). These factors, however, have relatively low predictable power

for the development of paranoid symptoms. For example, approximately 25% of individuals have experienced traumatic events during their life-time (Perkonigg et al., 2000), but the prevalence of clinical paranoid symptoms is substantially lower (Freeman et al., 2005). This is likely accounted by that stressful events and abnormal experiences are linked with paranoid ideation only indirectly in the presence of other risk factors (Bentall et al., 2001; Freeman, 2007). Additionally, the occurrence of specific life events or physical injuries is highly unpredictable by nature. Hence, they cannot serve as a stable basis for understanding the psychological etiology of paranoid ideation.

Secondly, epidemiological studies have found a range of sociodemographic correlates of paranoid ideation. Paranoid ideation is more common among male and among individuals without a romantic relationship (Freeman et al., 2011). Moreover, paranoid ideation is at a higher level among ethnic minorities (Cohen et al., 2004) and among individuals living in poverty (Freeman et al., 2011). Regarding age, paranoia seems to be at a higher level in adolescence than in middle adulthood (Freeman et al., 2011), but in older ages, there may potentially be an increase in the level of paranoid features (Östling et al., 2007). These epidemiological associations, however, are highly correlative by nature. Hence, they are beneficial in describing the sociodemographic factors of individuals with paranoid ideation, but not in explaining the etiological processes behind paranoid ideation.

Thirdly, there is evidence that a variety of cognitive characteristics are related to paranoid symptoms. Specific schematic beliefs about others (Freeman et al., 2002; Fowler et al., 2006), impairments in theory of mind (Craig et al., 2004; Randall et al., 2003), and certain attribution styles (Langdon et al., 2006; Krstev et al., 1999) are found to correlate with paranoid symptoms. Nevertheless, these factors may be rather partly overlapping concepts with paranoid thoughts or, in some cases, even consequences of paranoid ideation (Freeman, 2007). Moreover, the precise content of these cognitive features varies between individuals and also within individuals over time (Freeman, 2007). For example, the level of self-esteem may vary within a very short period in paranoid individuals and, hence, direct attempts to elevate low self-esteem may probably be ineffective (Thewissen et al., 2008). Consequently, a variety of the previously found psychological concomitants of paranoid ideation are of theoretical interest but, nevertheless, cannot form any stable and comprehensive basis for developing psychotherapeutic interventions.

Accordingly, a concern has been expressed that there is no established psychotherapeutic treatment program for paranoid ideation (Dixon-Gordon et al., 2011). The current forms of interventions, which are provided for patients with paranoid symptoms, appear to include comparatively heterogeneous procedures and also to be relatively ineffective (e.g. Dixon-Gordon et al., 2011; Karterud et al., 2003; Schneider & Klauer, 2001). Based on clinical observations, one essential issue behind the ineffectivity of the treatments is a strong defensive stance that is typical for patients with severe paranoid symptoms (Bateman et al., 2015; Dixon-Gordon et al., 2011). This defensive position is noted to interfere with the rapport during treatment process and also to complicate the development of therapeutic alliance (Dixon-Gordon et al., 2011). These observations indicate, firstly, that interventions should be provided in an

earlier phase of symptom development, when paranoid ideation is still at mild and subclinical level. This is because subclinical level of paranoid ideation is characterized by a lower conviction of the validity of paranoid beliefs and also with a lower distress related to the questioning of the content of paranoid beliefs (APA, 2013). Secondly, the defensive stance may refer to a possibility that there exists maladaptive dispositional personality traits beoynd the symptom level of paranoid ideation.

By definition, personality traits refer to individual differences in cognitive, emotional, and behavioral patterns that are relatively consistent over various situations (e.g. Tellegen, 1991). It has been shown that the rank-order consistency of personality traits (i.e. the extent to which relative differences between individuals in personality traits remain stable) is comparatively high over adulthood (e.g. Roberts, & DelVecchio, 2000; Robins et al., 2001). Over age, there are modest developmental changes in the levels of personality traits, but these changes are typically maturation-related and relatively consistent between individuals and, thus, quite predictable (Josefsson et al., 2013; Robins et al., 2001). Hence, discovering the relationships of personality traits with paranoid ideation might possibly provide a relatively stable basis for psychotherapeutic interventions for paranoid symptoms. Subsequently, there has been a demand that the relationship between personality traits and psychiatric symptoms should be more carefully investigated, especially when aiming to increase the understanding of subclinical symptoms (Livesley & Jang, 2000). In order to examine the relationship of personality dimensions with paranoid ideation, it is necessary to understand the theoretical background of personality dimensions.

1.3 THE ROLE OF PERSONALITY DIMENSIONS ON THE DEVELOPMENT OF PARANOID IDEATION

1.3.1 THE PSYCHOBIOLOGICAL MODEL OF PERSONALITY

When examining the relationships of personality traits with psychopathology, the psychobiological model of personality (Cloninger et al., 1993) has become a widely established theoretical framework. The psychobiological model identifies two layers at the trait level of personality: temperament and character (Cloninger et al., 1997). Temperament refers to preconceptual biases in perceptual memory and habit formation, and it can be perceived already in early childhood as automatic response patterns to environmental emotional stimuli (Cloninger et al., 1997). It is found to be moderately heritable (e.g. Ando et al., 2002). Temperament appears to have a relatively strong neurobiological basis: for example, it is linked to the secretion of certain neurotransmitters and the activation level of specific subcortical structures (e.g. Kim et al., 2002; Tuominen et al., 2012). Originally, temperament was defined to consist of three quantitative dimensions (Cloninger et al., 1997). Novelty seeking refers to the tendency to be impulsive, to explore novel and exciting stimuli actively, and to seek for risk-prone experiences. Harm avoidance reflects the tendency to fear in uncertain situations, to experience easily anticipatory worry and emotional distress,

and the need for routines and security. Reward dependence refers to the need for attachment and others' approval, sensitivity to others' socioemotional cues, and emotional warmth toward other people. Later, also a fourth dimension, persistence, was added to the core temperament dimensions (Cloninger et al., 1997). Persistence refers to a tendency to be hard-working and ambitious and to continue working despite frustration and fatigue (Cloninger et al., 1997).

Instead, character matures later from adolescence and adulthood onwards. Character involves concept-based processing and declarative memory, and it is supposed to be linked with neocortical and hippocampal processes (Cloninger et al., 1997). Character consists of three dimensions (Cloninger et al., 1997). Self-directedness refers to responsibility, purposefulness, resourcefulness in stressful situations, and a disciplined style of behaving. Cooperativeness reflects the degree of empathic and helpful behavior toward other people and the will to act according to ethical principles. Self-transcendence refers to self-forgetfulness, spiritual acceptance, and a tendency to regard everything conceived as essential and consequential parts of a unified whole. Taken together, character refers to the concepts about the self as an autonomous individual, as an integral part of humanity, and as an integral part of the universe as a whole (Cloninger et al., 1997).

Based on the psychobiological model, single personality dimensions interact with each other in such a way that different personality profiles predispose individuals to qualitatively distinct patterns of affective, cognitive, and behavioral functioning (Cloninger et al., 1997, 1999). For example, individuals with high novelty seeking and high reward dependence may strive for socially desirable exciting and impulsive activities, whereas people with high novelty seeking and low reward dependence may engage in impulsive antisocial behavior despite others' disapproval. Hence, an individual's functioning and adaptability to various psychosocial environments cannot be accurately predicted only by the variants of single personality dimensions, but the personality profiles must also be taken into consideration (Cloninger et al., 1997, 1999).

According to the psychobiological model, temperament profiles are differently associated with psychiatric disorders (Cloninger et al., 1999). That is, specific temperament profiles are expected to be linked with favorable psychosocial development and mental well-being, whereas other temperament profiles may represent subsyndromal forms or predictors of susceptibility to specific psychiatric disorders (Cloninger et al., 1999). However, the associations of temperament profiles with psychopathology are not inevitable, but they are modulated by the maturity of character. Each temperament profile can be associated with either a mature (healthy) character or with an immature (unhealthy) character. Mature character refers to high levels of self-directedness, cooperativeness, and self-transcendence, i.e. balanced and adaptive internal representations about the self, others, and the universe (Cloninger et al., 1997). Individuals with mature character profiles are able to control extreme variants of temperament dimensions, i.e. automatically activated affective-behavioral reaction patterns, and to adapt them to the social norms and ethical principles of the surrounding psychosocial environment by means of well-organized cognitive structures (Cloninger ym., 1999). Thus, in individuals with risky temperament profiles, the development of mature character is supposed to reduce the risk for psychiatric symptomatology.

By now, the predictive validity of the psychobiological model of personality has been widely demonstrated in the field of psychiatry. There is a great

amount of evidence that extreme variants of specific temperament and character dimensions are associated with, for example, depressive and anxiety disorders, eating disorders, and substance use disorders (Celikel et al., 2009; Fassino et al., 2002; Jylhä & Isometsä, 2006; Le Bon et al., 2004). With regard to paranoia, however, several aspects of its relationship with personality dimensions have remained unknown.

1.3.2 THE RELATIONSHIPS OF TEMPERAMENT AND CHARACTER WITH PARANOID IDEATION

The psychobiological model postulates that an explosive temperament profile composes a major risk for the development of paranoid symptoms (Cloninger et al., 1999). Explosive temperament profile is defined as consisting of high novelty seeking, high harm avoidance, and low reward dependence (Cloninger et al., 1997). That is, individuals with explosive temperament have low sensitivity to others socioemotional cues and remain easily detached from other people (low reward dependence), they have a high tendency for fearfulness, distress, and fatigability (high harm avoidance), and they are susceptible to risk-prone experiences and an impulsive lifestyle (high novelty seeking). Taken together, they are characterized by a marked reactivity of mood and tendencies to experience intense and labile affects, to behave in an impulsive and aggressive way, and to have conflicting or unstable interpersonal relatioships. Thus, explosive temperament is a temperament profile that consists of extreme and mutually conflicting variants of temperament dimensions.

However, based on the psychobiological model, the association between explosive temperament and paranoid ideation is modified by the maturity of character dimensions. Specifically, individuals with explosive temperament profile are suggested to avoid the development of paranoid symptoms, if they learn to regulate their extreme or conflicting variants of temperament dimensions in mature and adaptive ways, i.e. if they have an organized character profile (Cloninger et al., 1999). Organized character profile consists of high self-directedness, high cooperativeness, and low self-transcendence. Hence, organized character is characterized by high levels of analytic thinking, self-discipline, and resourcefulness in distressing situations (high self-directedness), and their style of interpersonal functioning is characterized by high compassion, helpfulness, and respect for ethical principles (high cooperativeness). Thus, individuals with organized character profile have mature and balanced representations about the self and others. Moreover, organized character includes a low tendency to experience connections with the non-material aspects of the universe, i.e. low intuitiveness, imaginativeness, and spirituality (low self-transcendence).

To date, several previous studies have suggested a link of these variants of temperament and character dimensions with paranoia both in clinical (Conrad et al., 2009; Gutiérrez et al., 2002; Švrakić et al., 2002, 2003) and non-clinical populations (Bagby et al., 2005; Griego et al., 1999; Ha et al., 2007; Mulder et al., 1999). However, these studies have included a variety of methodological limitations. Firstly, all the previous studies have been cross-sectional. Hence, it has remained unknown whether the association of personality dimensions with paranoia may be

obtained only at one time point or whether the association might be evident over a long-term follow-up. Secondly, previous studies have investigated only single-trait correlations of personality dimensions with paranoid symptoms, even though it is the personality profile that has a specific theoretical meaning (Cloninger et al., 1999). Thirdly, the samples of earlier studies have consisted of heterogeneous groups of psychiatric patients, for example, patients with eating disorders (e.g. Bejerot et al., 1998; Mulder et al., 1999). Hence, it is necessary to investigate the relationship of personality dimensions with paranoid ideation in studies with population-based samples and long follow-up periods over age, and to simultaneously adopt the use of multi-trait profiles.

1.3.3 EXPLOSIVE TEMPERAMENT PROFILE AND CHARACTER DEVELOPMENT

As suggested in the psychobiological model, explosive temperament profile predisposes to the development of paranoid symptoms only when accompanied by an immature character profile, i.e. low self-directedness and low cooperativeness. However, it remains uncertain how consistently explosive temperament is associated with the development of self-directedness and cooperativeness. That is, how likely are individuals with explosive temperament profile to develop such variants of character dimensions that might protect against paranoid ideation.

The psychobiological model postulates that temperament profiles are linked with character development in complicated but still consistent ways (Cloninger et al., 1997). It is suggested that such temperament profiles, which include extreme and mutually conflicting variants of temperament dimensions, may constitute a particular challenge for character development (Cloninger et al., 1997). Especially, individuals with explosive temperament profile are postulated to be in the highest risk group for the development of low self-directedness and low cooperativeness, when compared with any other temperament profile (Cloninger et al., 1997).

Previously, there has been only one study investigating the association of explosive temperament profile with character dimensions. The study found that as many as 72% of individuals with explosive temperament are in the bottom third of the general population with regard to character maturity (Cloninger et al., 1997). In addition, there exist studies examining the single-trait correlations between temperament and character dimensions, but the results have been partially contradictory. Some of these studies have suggested a correlation of high harm avoidance, high novelty seeking, and low reward dependence (i.e. variants of explosive temperament profile) with lower self-directedness and lower cooperativeness (Dzamonja-Ignjatovic et al., 2010; Goncalves & Cloninger, 2010; Jylhä & Isometsä, 2006; Pélissolo & Lépine, 2000). In other studies, however, such correlations have not been found (e.g. Brändström et al., 1998; De Fruyt et al., 2000; Gillespie et al., 2003).

The partially contradictory findings of single-trait correlations may be accounted by that character dimensions cannot be accurately predicted only by

variants of single temperament dimensions, but the temperament profile must also be specified (Cloninger et al., 1997). For example, when accompanied by low harm avoidance and high reward dependence, high novelty seeking is supposed to be linked with mature character (Cloninger et al., 1997). Instead, in combination with high harm avoidance and low reward dependence, high novelty seeking is suggested to correlate with immature character (Cloninger et al., 1997). Hence, it is necessary to use a multi-trait profile of temperament, when investigating the relationship between temperament and character dimensions. Moreover, all the previous studies have been cross-sectional. Consequently, it has remained unknown, whether the association of explosive temperament profile with character is evident consistently over age and developmental transitions in adulthood.

1.3.4 THE MODIFYING ROLES OF SOCIAL SUPPORT AND ATTACHMENT SECURITY

Temperament profile is supposed to partially constrain but not fully determine the development of character dimensions (Cloninger et al., 1997). This is because character development necessarily occurs within a wider environmental context, so that sociocultural learning, life experiences, and the quality of psychosocial circumstances also have a crucial role for the development of character dimensions (Cloninger et al., 1997). Specifically, individuals with explosive temperaments are expected to develop immature character profile in neutral psychosocial environments, whereas in some qualitatively different environments they might potentially reach the average levels of self-directedness and cooperativeness (Cloninger et al., 1997). However, no study has examined which psychosocial factors could ameliorate the suggested unfavorable character development in people with explosive temperaments in adulthood.

Explosive temperament profile is characterized by impulsivity, affective instability due to intense and episodic changes in current mood, and unbalanced or unstable interpersonal relationships (Cloninger et al., 1997). Such personality characteristics are found to be linked with approach-avoidance conflicts, excessive dependency, and fear of rejection (Bornstein et al., 2010; Lazarus et al., 2014). It has been stated that in individuals with this kind of personalities, it is especially the impairment in close interpersonal relationships that has a critical role for the later course of psychosocial development (Cloninger et al., 1997; Lazarus et al., 2014; Stanley & Siever, 2009). Consequently, one salient factor that could be associated with more mature character development in explosive individuals might be secure attachment.

Attachment refers to one's cognitive schemas about how to create and maintain close interpersonal relationships (Simmons et al., 2009). Adulthood attachment style develops in a complex and dynamic interaction between early interactive experiences with caregivers, environmental circumstances, and one's psychobiological qualities (Mikulincer & Shaver, 2007). Secure attachment refers to an intrinsic reliance on others' good intentions and trust on others in distressing

situations (Simmons et al., 2009). Moreover, secure attachment includes a healthy respect for others' needs and the capacity for autonomous functioning, when situationally appropriate (Lopez & Brennan, 2000; Mikulincer, 1998). Instead, individuals with insecure attachment may have a constant fear of becoming rejected and excessive dependency on others (i.e. anxious attachment); or they may have excessive self-reliance and inability to seek for comfort from others, when needed (i.e. avoidant attachment); or they may have disorganized and inconsistent schemas about functioning in interpersonal relationships (i.e. unresolved attachment) (Simmons et al., 2009).

Attachment security is shown to largely influence one's perception of the availability of social support (Collins & Feeney, 2004; Mallinckrodt & Wei, 2005). Based on clinical observations, adults with insecure attachment commonly lack the required skills for creating supportive interpersonal relationships, clearly communicating their needs, and resolving their interpersonal conflicts in adaptive ways (Mallinckrodt, 2000). Subsequently, besides of dysfunctions in attachment system, personality characteristics typical for explosive temperament profile are linked also with difficulties in recognizing appropriate sources of social support (Clifton et al., 2007) and with less social support seeking (Bijttebier & Vertommen, 1999). Consequently, high perceived social support might be another factor that could help individuals with explosive temperaments to reach the average level of self-directedness and cooperativeness.

By now, previous studies have suggested a correlation of insecure attachment with lower reward dependence and higher novelty seeking (i.e. variants including in explosive temperament profile) and also with lower self-directedness and lower cooperativeness (Abbate-Daga et al., 2010; Chotai et al., 2005; Martinotti et al., 2008; Picardi et al., 2005). Correspondingly, in some studies, lower social support is found to be linked with higher novelty seeking and lower reward dependence as well as with lower character traits (Cloninger & Zohar, 2011; Josefsson et al., 2011a; Yuh et al., 2008).

However, studies with long-term follow-ups are lacking, even though there is evidence that the influence of various psychosocial factors on personality development varies over age (Trzesniewski et al., 2004). Moreover, the samples of previous studies have commonly consisted of heterogeneous patient groups. This constrains the generalizability of the findings, since there are differences in character development between various patient populations (e.g. Celikel et al., 2009; Fassino et al., 2002). Finally, none of the studies have examined, whether there are interaction effects of explosive temperament with attachment security or social support. That is, whether the positive influences of attachment security and social support on character development are similar in individuals with explosive temperaments than other temperaments. This is a crucial question, since various temperament profiles are suggested to interact with psychosocial factors in different ways (Cloninger et al., 1997).

1.4 THE CONNECTIVITY OF PARANOID IDEATION WITH OTHER PSYCHIATRIC SYMPTOMS

It has been widely recognized that paranoid symptoms commonly interact and co-occur with a range of other psychiatric symptoms. There is accumulating evidence for associations of paranoid symptoms with, for example, depression, panic disorder, social phobia, post-traumatic stress disorder, and substance abuse disorders (Alsawy et al., 2015; Chen et al., 2003; Freeman et al., 2011; Grant et al., 2005). Furthermore, the co-occurrence of psychiatric symptoms is estimated to be much more common than has been obtained at diagnostic level: in fact, patients with only a single psychiatric disorder may represent an atypical minority in clinical populations (Brown & Barlow, 2005; Hyman, 2010).

The substantial connectedness between paranoid symptoms and other psychiatric symptoms has crucial consequences in the context of clinical healthcare. If paranoid symptoms are regarded as diagnostically secondary in relation to other co-occurring psychiatric symptoms, they may remain without appropriate consideration in healthcare system. According to the DSM-5 (Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition), the presence of bipolar disorder, some types of depressive disorders, or psychotic disorders may exclude the possibility to be diagnosed with paranoid personality disorder (APA, 2013). Hence, there has been a concern that in many cases even severe and clinically distressing paranoid symptoms may remain as an overlooked mental health problem (Dixon-Gordon et al., 2011). As a solution to these challenges, diagnostic classifications have strived for increasing comorbidity rates by reducing the number of mutually exclusive diagnoses (First, 2005). Along with this, it has been highlighted that comorbidity should be utilized as a tool for recognizing the full range of targets for treatment more widely than previously (Dell'Osso & Pini, 2012). Hence, there is an increasing demand to investigate the interaction of paranoid ideation with other psychiatric symptoms.

1.4.1 THE CO-OCCURRENCE BETWEEN DEPRESSIVE SYMPTOMS AND PARANOID IDEATION

The link between depression and paranoia constitutes an especial challenge for the mental health workers. It has been demonstrated that among patients with clinical depression, paranoid symptoms are associated with poorer treatment outcome (Joyce et al., 2007; Mrazek et al., 2014; Skodol et al., 2011). Correspondingly, clinical observations suggest that co-occurring depressive symptoms are a crucial factor reducing the effectivity of the psychotherapeutic interventions for paranoid patients (Bockian, 2006). Consequently, individuals with co-occurring depressive and paranoid symptoms appear to form an especially treatment-resistant patient population.

In the 1980s, paranoia and depression were regarded even as partly overlapping concepts. Paranoia was defined as a camouflaged form of depression: paranoia was supposed to serve as a defense mechanism that maintains one's self-esteem in the presence of an underlying depressive mode (Zigler & Glick, 1988). Since then, the relationship between depression and paranoia has provoked substantial

interest. The link between depressive symptoms and paranoid ideation has been found both at clinical and subclinical levels (Freeman et al., 2008, 2012, 2013; Kool et al., 2000; Johnson et al., 1995; Martin & Penn, 2001; Thewissen et al., 2011). In fact, as many as 25% of depressed patients are found to have clinical paranoid symptoms (Kool et al., 2000; Ramklint & Ekselius, 2003). Nevertheless, there has been no study with a follow-up of several years that had examined the relationship of depressive symptoms with paranoid ideation in adulthood in the general population. Hence, several essential aspects of this relationship have remained unknown.

Firstly, it is uncertain how consistent is the relationship of depressive symptoms with paranoid ideation, i.e. whether the association may be identified only in cross-sectional designs at one time point or whether the association is evident over age in a long-term follow-up. One study with a 8-year follow-up resulted in finding no association between depression in adolescence and paranoid ideation in adulthood (Kasen, 2001). This result, however, may be accounted by the diagnostic differences between adolescence and adulthood depressive disorders (APA, 2013). Moreover, there have been a few longitudinal studies in adulthood. They have suggested that depressive symptoms predict the onset and persistence of paranoid symptoms in adulthood (Fowler et al., 2011; Freeman et al., 2012b), albeit in one study the association was comparatively weak (Moritz et al., 2017). However, the follow-ups have persisted at most 24 months. Hence, theoretic models of paranoia have suggested a predisposing and maintaining role for specific depressive symptoms, but highlighted the need for further evidence from longitudinal studies (Freeman & Garety, 2014).

Secondly, evidence is limited with regard to whether various depressive subsymptoms, such as negative attitude, performance difficulties, and somatic symptoms, are differently linked with the development of paranoid ideation. Recently, it has been highlighted that depressive subsymptoms should be examined separately, because patients with depressive disorders are shown to have highly varying symptom profiles (APA, 2013; Fried & Nesse, 2015). In a recent study, depression was found to include even 12 different subtypes, which differed from each other with regard to etiology, developmental course, and treatment-related demands (Rantala et al., 2017). Moreover, different depressive symptoms are found to be linked with different comorbidity patterns with other psychiatric symptoms (Lux & Kendler, 2010).

Previous studies have found an association of negative attitude (i.e. depressive mood and negative cognition) with paranoid ideation (Bentall et al., 2009; Corcoran, 2006; Fowler et al., 2011; Vorontsova et al., 2013). The association between negative attitude and paranoid ideation, however, might be mediated via depression-related performance difficulties. This is because performance difficulties, such as weaker social and executive functioning, have been found to correlate with negative attitude (Snyder et al., 2013) and also with higher paranoia (Freeman et al., 2011; Bentall et al., 2009; Vorontsova et al., 2013). Regarding somatic complaints, previous studies have reported that insomnia, weight change, and sensory disturbances are associated with paranoid symptoms (Freeman et al., 2011, 2012). Nevertheless, this association is suggested to be indirect via cognitive-affective risk factors such as current mood and performance difficulties (Freeman et al., 2002). To our knowledge,

no study has investigated simultaneously the associations of several different depressive subsymptoms with paranoid ideation.

Thirdly, it has remained unknown whether depressive symptoms are associated more strongly with state- or trait-level paranoia. That is, whether paranoid ideas appear and disappear along depressive episodes or whether they persist also after the stabilization of acute depressive state. Hence, there has been a demand for research delineating between state- and trait-level paranoid ideation (Corcoran et al., 2006). To date, there is evidence for a relationship between depressive symptoms and state paranoia: based on experimental studies, depressive mood increases the risk for paranoid ideas during the following days (Freeman et al., 2008; Thewissen et al., 2011). Furthermore, improvement of depressive symptoms appears to predict a decrease in paranoid features over the following weeks (Fava et al., 2002). With respect to a trait paranoia, observations in clinical settings have indicated that only protracted forms of depression might be linked with trait-level increase in paranoid ideation (Hirschfeld, 1999). However, studies with long follow-ups are needed to capture potential depression-related trait-level changes in paranoid ideation over developmental transitions.

2 AIMS OF THE PRESENT STUDY

This study adopts a dimensional viewpoint on paranoid ideation that has been called for previously (e.g. Freeman & Garety, 2014). That is, paranoid ideation is regarded as a continuum ranging from mild and subclinical paranoid ideas to severe paranoid beliefs. The first aim of this dissertation is to investigate the relationships of temperament and character dimensions with the development of paranoid ideation in adulthood. Consequently, we adopt a viewpoint of personality traits on the psychological etiology of paranoid ideation. This might provide new possibilities to identify individuals with highest risk for paranoid ideation. The second aim of the dissertation is to examine whether secure attachment and high social support might be associated with a more mature character development in individuals with explosive temperaments. This might imply that secure attachment and high social support might have a protective influence against paranoid ideation in individuals with explosive temperaments. Hence, this could possibly provide evidence for developing psychotherapeutic interventions for individuals with temperament-related susceptibilities for paranoid ideation. The third aim of this dissertation is to investigate the co-occurrence of depressive symptoms with paranoid ideation from late adolescence to middle age. This might improve the quality of treatment and diagnostic accuracy of patients with co-occurring depressive and paranoid symptoms, who are noted to constitute a relatively treatment-resistant patient population. Overall, this dissertation might provide evidence how affective processes, whether related to depressive symptoms or affective response patterns of temperament dimensions, might contribute to the development of paranoid ideation. Three separate studies were conducted.

Study I. The aim of the Study I was to examine (i) whether single temperament and character dimensions are associated with the development of paranoid ideation (ii) whether explosive temperament profile and organized character profile are related to the development of paranoid ideation over a 15-year follow-up in adulthood.

Study II. The aim of the Study II was to investigate (i) whether explosive temperament profile is associated with the development of self-directedness and cooperativeness over a 15-year follow-up in adulthood and (ii) whether social support and attachment security modify the association of explosive temperament with self-directedness and cooperativeness.

Study III. The aim of the Study III was to examine (i) whether there is a co-occurrence between depressive symptoms and paranoid ideation from late adolescence to middle age (ii) whether various depressive subsymptoms are differently linked with the course of paranoid ideation

(iii) whether depressive symptoms are associated with state- or trait-level course of paranoid ideation, i.e. whether paranoid ideation appears and disappears along depressive episodes or whether paranoid ideation persist also after the improvement of acute depressive symptoms.

3 METHODS

3.1 PARTICIPANTS

All participants of this dissertation were selected from The Cardiovascular Risk in Young Finns Study (YFS), which started in 1980. YFS is an ongoing follow-up study that investigates risk factors for the symptoms of coronary heart disease in the Finnish population. The participants were selected randomly in all five Finnish university cities with medical schools and their rural surroundings in the population register of the Social Insurance Institution, which is a database covering the whole population of Finland. The sample consisted of six different age cohorts, who were born in 1962, 1966, 1969, 1972, 1975, and 1977. Altogether 4320 people were invited and 3596 (83%, 1832 boys and 1764 girls) of them participated in the baseline study in 1980 (aged 3-, 6-, 9-, 12-, 15-, and 18- years-olds). The sample has been shown to represent reasonably well the Finnish population with regard to sociodemographic factors (Raitakari et al., 2008). There have been eight follow-up measurement times with psychological variables in 1983, 1986, 1989, 1992, 1997, 2001, 2007, and 2012. In 2012, participants were aged 35-, 38-, 41-, 44-, 47-, and 50-years-olds.

The study was carried out in accordance with the Declaration of Helsinki, and the study design was approved by the ethical committees of all the Finnish universities with medical schools. All the participants or their parents provided informed consent before participation in the study. The design of the YFS is described more exactly elsewhere (Raitakari et al., 2008).

The measurement years of all study variables are presented in Table 1. The participants, who were included in Studies I–III, were required to have complete data for each study variable in at least one of its measurement times. Consequently, the final number of participants varied between different studies. There were 2137, 2028, and 2109 participants in Study I, Study II, and Study III, respectively. The research design, study variables, and main statistical methods of Studies I–III are shown in Table 2. Means, frequencies, standard deviations, and ranges of study variables are presented in Table 3.

Table 1. *The measurement years of the study variables in Studies I–III.*

	Measurement year					
	1980	1992	1997	2001	2007	2012
Temperament						
Study I			X	X		X
Study II			X	X	X	
Character						
Studies I and II			X	X		X
Social support						
Study II			X	X	X	
Attachment security						
Study II				X	X	X
Paranoid ideation						
Study I			X	X		X
Study III	X	X	X	X	X	X
Depressive symptoms						
Study III	X	X	X	X	X	X
Socioeconomic status						
Studies I–III				X	X	
Parental socioeconomic status						
Studies I–III	X					

Table 2. *Research design, study variables, and main statistical method used in Studies I–III.*

	Study I	Study II	Study III
Research design	Longitudinal	Longitudinal	Longitudinal
Independent variables	Novelty seeking	Explosive temperament	Depressive symptoms
	Harm avoidance	Social support	Negative attitude
	Reward dependence	Attachment security	Performance difficulties
	Explosive temperament		Somatic complaints
	Self-directedness		
	Cooperativeness		
	Self-transcendence		
	Organized character		
Dependent variables	Paranoid ideation	Self-directedness	Paranoid ideation
		Cooperativeness	
Control variables	Age	Age	Age
	Gender	Gender	Gender
	Education	Education	Education
	Occupation	Occupation	Occupation
	Parental education	Parental education	Parental education
	Parental occupation	Parental occupation	Parental occupation
	Baseline level of paranoid ideation		
Main statistical method	Multilevel model for repeated measurements	Multilevel model for repeated measurements	Multilevel model for repeated measurements

Table 3. *Means, standard deviations (SD), frequencies, and ranges of the variables under study.*

	Study II (n = 2137)		Study I (n = 2028)		Study III (n = 2109)		
	Mean / Frequency (%)	SD	Mean / Frequency (%)	SD	Mean / Frequency (%)	SD	Range
Age in 1997	27.50	4.97	27.50	4.97	27.50	5.01	20−35
Gender							
Female	1209 (56.6)		1173 (57.8)		1199 (56.9)		
Male	928 (43.4)		855 (42.2)		910 (43.1)		
Novelty seeking	2.99	0.37	2.99	0.37			1−5
Harm avoidance	2.59	0.49	3.59	0.48			1−5
Reward dependence	3.33	0.41	3.33	0.41			1−5
Self-directedness	3.69	0.40	3.70	0.40			1−5
Cooperativeness	3.74	0.38	3.75	0.38			1−5
Self-transcendence	3.50	0.53					1−5
Explosive temperament profile							
1997	117 (7.8)		117 (8.2)				
2001	148 (8.7)		135 (8.0)				
2007			142 (9.0)				
2012	132 (9.3)						
Organized character profile							
1997	265 (20.1)						
2001	286 (17.6)						
2012	281 (20.7)						
Social support			50.39	8.13			12−60
Attachment security			18.11	3.40			7−28
Paranoid ideation	13.83	3.54			13.06	3.26	6−30
Total depressive symptoms					43.91	11.1	21−105
Depressive subsymptoms							
Negative attitude					16.61	4.49	8−40
Performance difficulties					14.10	4.39	7−35
Somatic complaints					12.76	3.38	6−30

All the studies of this dissertation had a longitudinal research design. As usual in longitudinal studies, there was some level of attrition during the follow-up period. In Studies I-III, we examined attrition by comparing the included and excluded participants with independent samples t-tests and chi-square tests of independence. Included participants were more likely to be women and had slightly higher occupational status and educational level in childhood and adulthood than excluded participants. Regarding personality dimensions, included participants had lower novelty seeking, lower harm avoidance, higher reward dependence, higher self-directedness, higher cooperativeness, and lower self-transcendence than excluded participants. Hence, included participants had on average more mature character dimensions than excluded participants. Additionally, included participants had milder depressive symptoms and a lower level of paranoid ideation than excluded participants. Consequently, in our data there was an attirition bias towards milder psychiatric symptoms, which needs to be taken into consideration.

3.2 MEASURES

3.2.1 TEMPERAMENT AND CHARACTER (STUDIES I AND II)

Temperament and character were measured with the version 9 of the Temperament and Character Inventory (TCI), which includes 240 self-rating items (Cloninger et al., 1994). In the present study, we used the temperament scales of Harm Avoidance (35 items), Novelty Seeking (40 items), and Reward Dependence (24 items), and the character scales of Self-Directedness (44 items), Cooperativeness (42 items), and Self-Transcendence (33 items). Instead of the original true/false response scale, we used a 5-point Likert-scale in order to be able to make more subtle distinctions, as has been done also in later versions of the TCI. The response alternatives ranged from 1 (completely disagree) to 5 (completely agree). For each dimension, a continuous sum score of the items was calculated for each measurement year. In Studies I and II, the internal consistencies (Cronbach's alpha) for the temperament and character scales were the following: Harm Avoidance α = .87–.93 between different measurement years; Novelty Seeking α = .75–.88; Reward Dependence α = .80–.88; Self-Directedness α = .90–.91; Cooperativeness α = .90–.91; and Self-Transcendence α = .91–.92. The factor structure and test-retest reliability of the scale have been confirmed previously (e.g. Hansenne et al., 2005; Pélissolo & Lépine, 2000).

When creating temperament and character profiles, participants were classified as being high (above the median) or low (below the median) with regard to each dimension, as has been done also in earlier studies (e.g. Hintsanen et al., 2012; Josefsson et al., 2011b). All the participants with high Novelty Seeking, high Harm Avoidance, and low Reward Dependence were classified as having explosive temperament profile. Correspondingly, all the participants with high Self-Directedness, high Cooperativeness, and low Self-Transcendence were classified as having organized character profile. The profiles were used to assign a binary status (explosive vs. non-explosive; organized vs. non-organized).

3.2.2 PARANOID IDEATION (STUDIES II AND III)

Paranoid ideation was measured with the Paranoid Ideation Scale of the Symptom Checklist-90 Revised (SCL-90-R; Derogatis, 1986). The SCL-90-R is a self-report inventory to measure psychiatric symptoms (Derogatis, 1986). The Paranoid Ideation Scale consists of 6 self-rating items (e.g. "I think that other people would take advantage of me if I let them to do that"; "I feel that others are talking about me behind my back") that are answered with a 5-point Likert-Scale (1 = totally disagree, 5 = totally agree). In Studies II and III, the internal consistency (Cronbach's alpha) for the scale was α = .71–.79 between different measurement years. The internal consistency and concurrent and differential validity of the scale are shown to be adequate also in previous studies (e.g. Olsen et al., 2004; Schmitz et al., 2000). The Paranoid Ideation scale has been widely used both in clinical and non-clinical populations (e.g. Chen et al., 2014; Fagnani et al., 2011; Wood et al., 2002). Based on previous recommendations (e.g. Freeman & Garety, 2014), paranoid ideation was treated as a continuous dimension, and we calculated a sum score of the items for each measurement time.

3.2.3 PERCEIVED SOCIAL SUPPORT (STUDY II)

Social support was measured using the Multidimensional Scale of Perceived Social Support (MSPSS) (Canty-Mitchell, J, & Zimet, 2000; Zimet et al., 1988). It consists of 12 self-rating items measuring perceived support from family (4 items, e.g. "I can discuss my problems with my family"), friends (4 items, e.g. "My friends really support me when I need help"), and a significant other (4 items, e.g. "I have a significant other who comforts me"). All the items were answered with a 5-point Likert-scale (1 = totally disagree, 5 = totally agree; internal consistency α = .93–.95 between different measurement years). We summed all the items together so that a higher value referred to a higher level of perceived social support. Previous studies have indicated moderate to high internal consistency, test-retest reliability, and predictive validity for the MSPSS in the Finnish population (Airaksinen et al., 2015; Josefsson et al., 2011a; Karukivi et al., 2011).

3.2.4 ATTACHMENT SECURITY (STUDY II)

Attachment style was measured using the Relationship Questionnaire¬ (Bartholomew & Horowitz, 1991). The questionnaire consists of four statements (e.g. "I strive for relationships that are as close as possible but others seem to avoid such closeness. It is difficult for me to live without close relationships. Sometimes I'm afraid that others do not appreciate me as much as I appreciate them."). The statements are answered with a 7-point Likert-scale (1 = does not describe me at all; 4 = describes me sometimes; 7 = describes me very well). We summed all the items together so that a

higher value referred to more secure attachment. The questionnaire has been used also previously in the research field of personality development and paranoia (e.g. Choi-Kain et al., 2009; Pickering et al., 2008). Previous studies have reported adequate predictive validity and high test-retest reliability during a 7-year follow-up for this scale in the same dataset, i.e. the Young Finns data (Pesonen et al., 2004; Salo et al., 2011).

3.2.5 DEPRESSIVE SYMPTOMS (STUDY III)

Depressive symptoms were measured with a modified version of the Beck Depression Inventory (BDI; Beck & Beamesderfer, 1974). The modified BDI (mBDI) includes those statements of the BDI that measure the second mildest depressive symptoms. The statements are answered with a 5-point Likert-scale (1 = totally disagree, 5 = totally agree). Thus, it captures mild depressive symptoms more sensitively than the original BDI-II and is found to be an especially valuable measure when investigating depressive symptoms in the general population (e.g. Katainen et al., 1999; Nurmi et al., 1995; Rosenström et al., 2012). The mBDI consists of three factors: Negative Attitude (8 items, e.g. "I feel melancholic"), Performance Difficulties (7 items, e.g. "My confidence has decreased and I try to postpone decision making"), and Somatic Complaints (6 items, e.g. "My appetite is lower than previously"). The mBDI has been used in earlier studies, too (e.g. Oikonen et al., 2014), and a detailed description of the measure has been published previously (Elovainio et al., 2005).

In the present study, we computed a score of total depressive symptoms and depressive subsymptoms for each measurement time. The internal consistencies for the scales were the following: total depressive symptoms α = .87–.93 between different measurement years; Negative Attitude α = .75–.88; and Performance Difficulties α = .81–.88. For Somatic Complaints, the internal consistency was comparatively low in 1992 (α = .59) but roughly higher in later measurement times (α = .69–.73). Reliability analyses revealed that deleting any single item would not have improved significantly the Cronbach's alpha of the Somatic Complaints scale in 1992. We did not undertake any major changes to the scale, because its factor structure has been confirmed previously (e.g. Heponiemi et al., 2006) and our goal was to keep the results comparable with earlier studies and also later measurement years in our study.

3.2.6 SOCIOECONOMIC STATUS (STUDIES I–III)

Participants' and their parents' socioeconomic status was measured by occupational status and the number of educational years. Occupational status was evaluated by the year 1979 (parents) or 2001 (participants) classification of the Center of Statistics in Finland. Parents' educational years and occupational status were calculated if the information was available for at least one parent, and if they were available for both parents, we used the higher available value. In all the analyses of Studies I–III,

socioeconomic variables were controlled for and added to the analyses as separate variables.

3.3 STATISTICAL ANALYSES

In all studies of this dissertation, we used multilevel models (MLMs) for repeated measurements. MLMs can model dependencies between observations of repeated measurements, and estimate simultaneously fixed effects (classic regression coefficients) and random effects, which refer to individual-level variance in intercept and slopes and residual variance (within-individual variation in the predicted variable over repeated measurements). All the observations were nested within participants. We calculated Cox and Snell's generalized R squared (Cox & Snell, 1989) for each model in order to estimate, how much the full model reduced residual variance of the predicted variable, when compared to the intercept-only (null) model. That is, to what extent the predictive variables account for the total variance of the predicted variable. Statistical analyses were conducted with Stata SE version 13.0 and IBM SPSS Statistics 23.0. All the analyses in Studies I–III were controlled for age, gender, and socioeconomic factors in both childhood and adulthood.

Study I. In all MLMs, the dependent variable was paranoid ideation. In models 1–3, we examined the associations of single temperament and character dimensions with the development of paranoid ideation. In model 1, intercept, measurement time, age, gender, socioeconomic factors, and temperament dimensions were set as fixed effects. Intercept and temperament dimensions were treated also as random effects. In models 2a–c, we added each character dimension separately to the fixed and random effects, and in model 3, all the character dimensions were added simultaneously to the fixed and random effects.

In models 4, we examined the associations of explosive temperament profile and organized character profile with paranoid ideation. In model 4a, intercept, measurement time, age, gender, socioeconomic factors, and explosive temperament profile were set as fixed effects. Intercept was treated also as a random effect. In model 4b, we added organized character profile to the fixed effects. In model 4c, we added the interaction effect of explosive temperament with organized character profile to the fixed effects, in order to investigate whether the effect of explosive temperament on paranoid ideation is different between individuals with organized character profile and other character profiles. In all the MLMs, the level of paranoid ideation in 1992 was added to fixed effects in order to control the baseline level of paranoia.

Study II. We conducted separate MLMs for predicting self-directedness (models 5) and cooperativeness (models 6). Firstly, we investigated the association of explosive temperament profile with self-directedness (model 5a) and cooperativeness (model 6a). Intercept, explosive temperament profile, measurement time, age, gender, participants' and their parents' socioeconomic factors were set as fixed effects. Intercept and explosive temperament profile were treated also as random effects.

Secondly, we examined the association of social support and attachment security with self-directedness (model 5b) and cooperativeness (model 6b), and added social support and attachment security both as fixed and random effects to the model. Thirdly, we examined the interaction effects of explosive temperament with social support and attachment security on self-directedness (model 5c) and cooperativeness (model 6c). That is, we investigated whether the effects of social support and attachment security on self-directedness and cooperativeness were similar in individuals with explosive temperament profile and other temperaments.

Study III. In all MLMs, the dependent variable was paranoid ideation over years 1992–2012. Age referred to participant's age at each measurement point, ranging from 15 (the age of the youngest cohort in 1992) to 50 (the age of the oldest cohort in 2012). Age was centered at age 15. Model 7 was an unconditional growth model for paranoid ideation with intercept, age, age-squared, gender, and socioeconomic factors as fixed effects, and intercept and age as random effects. In model 8, we examined the effect of total depressive symptoms on the course of paranoid ideation. We added the total score of depressive symptoms and its age-interaction to fixed effects. Next, in models 9a–c, we examined the associations of depressive subsymptoms with paranoid ideation. We added separately each subsymptom score and its age-interaction to fixed effects. In model 9d, we added simultaneously all the subsymptom scores and their age-interaction effects to fixed effects. In all the models, except for the unconditional model, depressive symptoms were added also to random effects.

The associations of depressive symptoms with trait- and state-level paranoia were investigated by comparing whether adding depressive symptoms to the unconditional model (null model) reduced more the variance of intercept (i.e. between-individual variation in the level of paranoia over the follow-up) or the residual variance of paranoia (i.e. within-individual variance between measurement times). That is, whether depressive symptoms accounted for the between-individual variance of paranoid ideation (trait paranoia) or within-individual variance of paranoid ideation (state paranoia).

In model 10, we examined the association of changes in depressive symptoms with changes in paranoid ideation. We used year 1992 scores as baseline levels for depressive symptoms and paranoid ideation. For year 1997, 2001, 2007, and 2012 symptom scores, we calculated their difference with the preceding measurement point (e.g. year 2001 score minus year 1997 score etc.) and used these difference scores as indicators for the change in the symptom level between measurement years. The dependent variable was change in paranoid ideation. We added intercept, age, age-squared, change in depressive symptoms and its age-interactions, baseline paranoid ideation in 1992, baseline depressive symptoms in 1992, gender, and socioeconomic factors to fixed effects. Intercept was treated also as random effect.

4 RESULTS

4.1 THE EFFECTS OF TEMPERAMENT AND CHARACTER ON PARANOID IDEATION

Table 4 shows the effects of single temperament and character dimensions on paranoid ideation. High novelty seeking, high harm avoidance, and low reward dependence predicted the development of higher paranoid ideation. After adding self-directedness to the model, the effects of novelty seeking and harm avoidance on paranoid ideation disappeared, and after adding cooperativeness to the model, the effects of novelty seeking and reward dependence disappeared. Instead, after adding self-transcendence to the model, all the associations between temperament traits and paranoid ideation remained significant. When adding simultaneously all character dimensions to the model, the effects of temperament dimensions mostly disappeared. Taken together, the effects of temperament dimensions mostly disappeared, when controlling for character dimensions. Higher self-directedness, higher cooperativeness, and lower self-transcendence were associated with the development of lower paranoid ideation. Regarding random effects, there was significant but still minor individual-level variation in the slopes of temperament dimensions. The individual level variation in the slopes of character dimensions was nonsignificant. This indicated that the effect of personality dimensions on paranoid ideation was relatively stable between individuals.

Table 5 presents the effects of explosive temperament profile and organized character profile on paranoid ideation. Having explosive temperament profile was associated with the development of higher paranoid ideation, whereas having organized character was related to lower level of paranoid ideation. After adding organized character to the model, explosive temperament still predicted higher level of paranoid ideation. This indicated that explosive temperament was associated with higher paranoid ideation also in those individuals who had organized character profile. The interaction effect between explosive temperament profile and organized character profile was nonsignificant, indicating that the effect of organized character on paranoid ideation was of same magnitude in individuals with explosive temperament than in individuals with other temperaments.

Table 4. *Multilevel models of single temperament and character dimensions as predictors of standardized scores of paranoid ideation.*

	Model 1 (R^2 = .89)	Model 2a (R^2 = .92)	Model 2b (R^2 = .91)	Model 2c (R^2 = .91)	Model 3 (R^2 = .94)
	Estimate (Standard error)	Estimate (Standard error)	Estimate (Standard error)	Estimate (Standard error)	Estimate (Standard error)
Fixed effects					
Intercept	0.04 (0.06)	0.07 (0.06)	0.03 (0.06)	0.12 (0.06)*	0.12 (0.06)*
Novelty seeking	0.10 (0.02)***	0.00 (0.02)	0.03 (0.02)	0.07 (0.02)***	-0.04 (0.02)*
Harm avoidance	0.29 (0.02)***	0.01 (0.02)	0.17 (0.02)***	0.29 (0.02)***	0.02 (0.02)
Reward dependence	-0.13 (0.02)***	-0.09 (0.02)***	0.03 (0.02)	-0.17 (0.02)***	-0.03 (0.02)
Self-directedness		-0.44 (0.02)***			-0.30 (0.02)***
Cooperativeness			-0.35 (0.02)***		-0.24 (0.02)***
Self-transcendence				0.21 (0.02)***	0.17 (0.02)***
Random effects					
Variance of intercept	0.21 (0.02)***	0.14 (0.02)***	0.18 (0.02)***	0.17 (0.02)***	0.12 (0.02)***
Variance of novelty seeking	0.02 (0.01)*	0.03 (0.01)*	0.02 (0.01)	0.02 (0.01)	0.02 (0.01)
Variance of harm avoidance	0.03 (0.01)*	0.02 (0.01)	0.03 (0.01)**	0.03 (0.01)*	0.03 (0.01)*
Variance of reward dependence	0.05 (0.01)***	0.05 (0.01)***	0.04 (0.01)**	0.06 (0.01)***	0.04 (0.01)***
Variance of self-directedness		0.01 (0.01)			0.00 (0.01)
Variance of cooperativeness			0.02 (0.01)		0.01 (0.01)
Variance of self-transcendence				0.01 (0.01)	0.00 (0.01)
Residual variance	0.34 (0.01)***	0.30 (0.01)***	0.31 (0.01)***	0.33 (0.01)***	0.29 (0.01)***

*** $p < .001$ ** $p < .01$ * $p < .05$ *Note*: Model 1: All temperament dimensions were added simultaneously to the model. Models 2a–2c: Each character dimension was added separately to the model. Model 3: All character dimensions were added simultaneously to the model. All the models were adjusted for age, gender, socioeconomic factors, measurement year, and the baseline level of paranoid ideation in 1992.

Table 5. *Multilevel models of explosive temperament profile and organized character profile as predictors of standardized scores of paranoid ideation.*

	Model 4a (R^2 = .87)	Model 4b (R^2 = .91)	Model 4c (R^2 = .91)
	Estimate (Standard error)	Estimate (Standard error)	Estimate (Standard error)
Fixed effects			
Intercept	-0.03 (0.07)	0.15 (0.06)*	0.15 (0.06)*
Explosive temperament[a]	0.32 (0.05)***	0.28 (0.05)***	0.29 (0.05)***
Organized character[b]		-0.60 (0.04)***	-0.60 (0.04)***
Explosive temperament*Organized character			-0.11 (0.19)
Random effects			
Variance of intercept	0.31 (0.02)***	0.27 (0.02)***	0.27 (0.02)***
Residual variance	0.39 (0.01)***	0.37 (0.01)***	0.38 (0.01)***

*** $p < .001$ ** $p < .01$ * $p < .05$ [a] Individuals without the explosive profile as the reference group. [b] Individuals without the organized profile as the reference group. *Note*: Model 4a: Explosive temperament was added to fixed effects. Model 4b: Organized character was added to fixed effects. Model 4c: The interaction effect between explosive temperament and organized character profiles was added to fixed effects. All the models were adjusted for age, gender, socioeconomic factors, measurement year, and the baseline level of paranoid ideation in 1992.

4.2 THE ASSOCIATION OF EXPLOSIVE TEMPERAMENT WITH CHARACTER DIMENSIONS: THE MODERATING EFFECTS OF SOCIAL SUPPORT AND ATTACHMENT SECURITY

Tables 6 and 7 show the effects of explosive temperament profile, social support, and attachment security on self-directedness and cooperativeness. Explosive temperament was associated with the development of lower self-directedness and lower cooperativeness (Figure 1). This association remained after controlling for social support and attachment security, which implied that social support and attachment security did not mediate the association of explosive temperament with lower self-directedness and cooperativeness. Both higher social support and more secure attachment predicted higher self-directedness and higher cooperativeness. Interaction effects of explosive temperament with social support and attachment security were nonsignificant, when predicting self-directedness or cooperativeness. Thus, the effects of social support and secure attachment on self-directedness and cooperativeness were of same magnitude in individuals with explosive temperament and other temperaments.

Regarding random effects, there was significant but still minor individual-level variation in the slopes of social support and attachment security. Individual level variation in the slope of explosive temperament was mostly nonsignificant. This indicated that the associations of explosive temperament profile, social support, and attachment security with self-directedness and cooperativeness were comparatively stable between individuals.

Table 6. *Multilevel models of explosive temperament profile, social support, and attachment security as predictors of standardized scores of self-directedness.*

	Model 5a (R^2 = .40)	Model 5b (R^2 = .77)	Model 5c (R^2 = .77)
	Estimate (Standard error)	Estimate (Standard error)	Estimate (Standard error)
Fixed effects			
Intercept	-0.70 (0.14)***	-0.39 (0.13)**	-0.39 (0.13)**
Explosive temperament[a]	-0.48 (0.05)***	-0.32 (0.05)***	-0.29 (0.05)***
Social support		0.26 (0.02)***	0.26 (0.02)***
Social support*Explosive temperament[a]			0.02 (0.04)
Attachment security		0.22 (0.02)***	0.22 (0.02)***
Attachment security*Explosive temperament[a]			0.06 (0.05)
Random effects			
Variance of intercept	0.56 (0.04)***	0.35 (0.03)***	0.35 (0.03)***
Variance of explosive temperament	0.06 (0.03)	0.03 (0.03)	0.04 (0.03)
Variance of social support		0.03 (0.01)**	0.03 (0.01)**
Variance of attachment security		0.03 (0.01)**	0.03 (0.01)**
Residual variance	0.30 (0.01)***	0.26 (0.01)***	0.26 (0.01)***

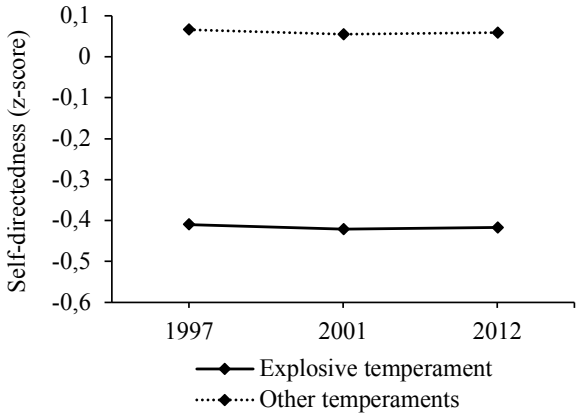
*** $p < 0.001$ ** $p < 0.01$ * $p < 0.05$ [a] Individuals without explosive temperament profile as the reference group. *Note*: In model 5a, explosive temperament profile was added to the model. In model 5b, social support and attachment security were added to the model. In model 5c, the interaction effect of explosive temperament with social support and attachment security were added to the model. All the models were adjusted for age, gender, measurement year, and socioeconomic factors.

Table 7. *Multilevel models of explosive temperament profile, social support, and attachment security as predictors of standardized scores of cooperativeness.*

	Model 6a (R^2 = .43)	Model 6b (R^2 = .77)	Model 6c (R^2 = .77)
	Estimate (Standard error)	Estimate (Standard error)	Estimate (Standard error)
Fixed effects			
Intercept	-0.89 (0.14)***	-0.59 (0.13)***	-0.59 (0.13)***
Explosive temperament[a]	-0.52 (0.05)***	-0.36 (0.05)***	-0.39 (0.05)***
Social support		0.21 (0.02)***	0.21 (0.02)***
Social support*Explosive temperament[a]			0.01 (0.04)
Attachment security		0.20 (0.02)***	0.21 (0.02)***
Attachment security*Explosive temperament[a]			-0.07 (0.05)
Random effects			
Variance of intercept	0.51 (0.04)***	0.36 (0.03)***	0.36 (0.03)***
Variance of explosive temperament	0.10 (0.04)**	0.04 (0.03)	0.04 (0.03)
Variance of social support		0.03 (0.01)*	0.03 (0.01)*
Variance of attachment security		0.04 (0.01)**	0.04 (0.01)**
Residual variance	0.28 (0.01)***	0.25 (0.01)***	0.25 (0.01)***

*** $p < 0.001$ ** $p < 0.01$ * $p < 0.05$ [a] Individuals without explosive temperament profile as the reference group.
Note: In model 5a, explosive temperament profile was added to the model. In model 5b, social support and attachment security were added to the model. In model 5c, the interaction effect of explosive temperament with social support and attachment security were added to the model. All the models were adjusted for age, gender, measurement year, and socioeconomic factors.

a. Self-directedness.



b. Cooperativeness.

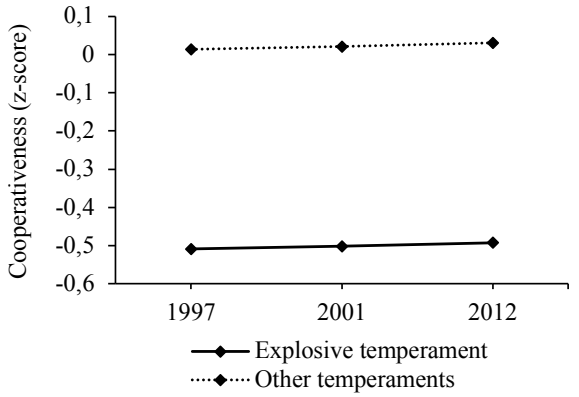


Figure 1. *Predicted self-directedness (a) and cooperativeness (b) over the follow-up separately for individuals with explosive temperament profile and other temperament profiles. Predicted means with 95% confidence intervals.*

4.3 THE ASSOCIATIONS OF DEPRESSIVE SYMPTOMS WITH PARANOID IDEATION

The associations between depressive symptoms and paranoid ideation are shown in Table 8. The fixed effects revealed that a higher total score of depressive symptoms was associated with a course of higher paranoid ideation. This association was evident from age 15 to 50, even though it slightly decreased over age, as indicated by the negative interaction between depressive symptoms and age (Figure 2). Regarding depressive subsymptoms, higher negative attitude, higher performance difficulties,

and higher somatic complaints were associated with more severe paranoid ideation, when added separately to the model. Instead, when adding depressive subsymptoms to the model simultaneously, the main effect of somatic complaints was no longer significant. However, the positive interaction of somatic complaints with age revealed that the effect of somatic complaints on paranoid ideation became significant over age (Figure 3). Random effects revealed that there was significant individual-level variance in the slopes of depressive symptoms and age.

Regarding the development of state vs. trait paranoia, our results indicated that after adding depressive symptoms to the unconditional model, the decrease was roughly greater in variance of intercept than in residual variance. That is, depression appeared to explain a greater amount of between-individual variation than within-individual variation in paranoia. This implies that depressive symptoms were associated more strongly with trait- than state-level paranoid ideation.

Table 8. *Multilevel models of depressive symptos and age as predictors of standardized scores of paranoid ideation.*

	Model 7 (R^2 = .14)	Model 8 (R^2 = .55)	Model 9a (R^2 = .50)	Model 9b (R^2 = .49)	Model 9c (R^2 = .33)	Model 9d (R^2 = .56)
	Estimate (SE)	Estimate (SE)	Estimate (SE)	Estimate (SE)	Estimate (SE)	Estimate (SE)
Fixed effects						
Intercept	0.93 (0.11)***	0.23 (0.04)***	0.29 (0.04)***	0.24 (0.04)***	0.33 (0.05)***	0.59 (0.10)***
Total depressive symptoms		0.57 (0.03)***				
Negative attitude			0.47 (0.02)***			0.32 (0.05)***
Performance difficulties				0.47 (0.02)***		0.29 (0.06)***
Somatic complaints					0.26 (0.02)***	-0.072 (0.04)
Age	-0.037 (0.01)***	-0.023 (0.00)***	-0.028 (0.00)***	-0.021 (0.00)***	-0.028 (0.00)***	-0.025 (0.01)***
Age squared	0.00024 (0.04)*	0.000072 (0.00)	0.00023 (0.00)**	0.000046 (0.00)	0.00018 (0.00)*	0.000086 (0.00)
Total depressive symptoms* Age		-0.0080 (0.00)*				
Total depressive symptoms* Age squared		0.00026 (0.00)**				
Negative attitude*Age			0.00075 (0.00)			-0.0020 (0.00)
Performance difficulties*Age				0.0011 (0.00)		-0.0011 (0.00)
Somatic complaints*Age					0.0039 (0.00)***	0.0042 (0.00)**
Random effects						
Variance of intercept	1.05 (0.05)*	0.53 (0.03)*	0.56 (0.03)*	0.56 (0.03)*	0.68 (0.03)*	0.70 (0.05)*
Variance of total depressive symptoms		0.21 (0.02)*				
Variance of negative attitude			0.19 (0.02)*			0.23 (0.03)*
Variance of performance difficulties				0.20 (0.02)*		0.27 (0.03)*
Variance of somatic complaints					0.20 (0.02)*	0.17 (0.02)*
Variance of age	0.028 (0.00)*	0.020 (0.00)*	0.021 (0.00)*	0.020 (0.00)*	0.024 (0.00)*	0.020 (0.00)*
Residual variance	0.62 (0.01)*	0.56 (0.01)*	0.57 (0.01)*	0.57 (0.01)*	0.59 (0.01)*	0.53 (0.01)*

*** $p < .001$ ** $p < .01$ * $p < .05$. SE = standard error. *Note:* Model 7 was an unconditional model with age terms as predictors. In model 8, total score of depressive symptoms were added to the model. In models 9a–c, depressive subsymptoms were added separately to the model. In model 9d, all depressive subsymptoms were added simultaneously to the model. All the models were adjusted for gender and socioeconomic factors.

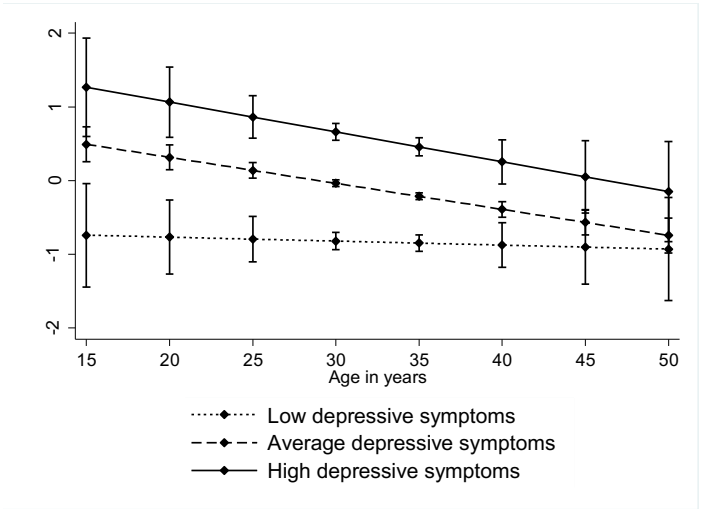


Figure 2. *Predicted paranoid ideation over age separately for individuals belonging to the lowest 10%, average, and the highest 10% in depressive symptoms. Predicted means with 95% confidence intervals.*

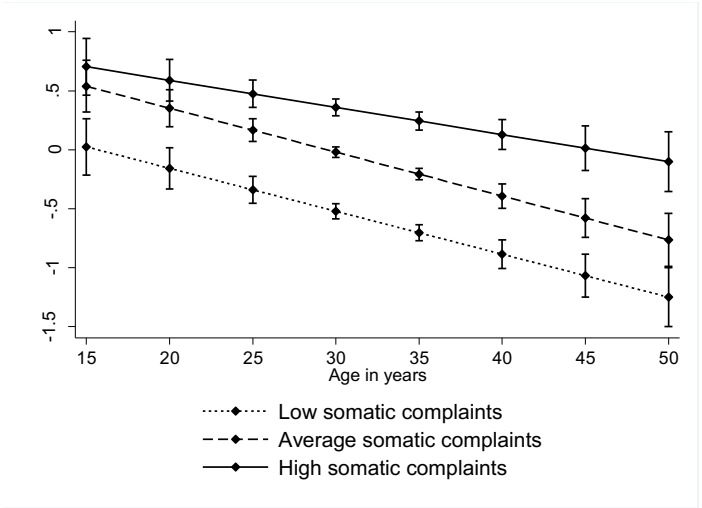


Figure 3. *Predicted paranoid ideation over age separately for individuals belonging to the lowest 10%, average, and the highest 10% in somatic complaints. Predicted means with 95% confidence intervals.*

Our results also revealed that changes in depressive symptoms were positively associated with changes in paranoid ideation (Table 9). Hence, increase in depressive symptoms was associated with increase in the level of paranoid ideation. This association, however, became weaker over age, which was revealed by the negative interaction of age with change in depressive symptoms (Figure 4). Thus, the level of paranoid ideation seemed to become more stable over age in relation to changes in depressive symptoms.

Table 9. *Multilevel models of age and change in depressive symptos as predictors of standardized scores of change in paranoid ideation.*

	Model 10 (R^2 = .63)
	Estimate (Standard error)
Fixed effects	
Intercept	-0.089 (0.08)
Change in depressive symptoms	0.54 (0.07)***
Age	0.014 (0.01)
Age-squared	-0.00035 (0.00)
Change in depressive symptoms*Age	-0.017 (0.01)*
Change in depressive symptoms*Age-squared	0.00043 (0.00)*
Random effects	
Variance of intercept	0.00 (0.00)*
Residual variance	0.89 (0.01)*

*** $p < .001$ ** $p < .01$ * $p < .05$ *Note:* The model was adjusted for gender, socioeconomic factors, baseline depressive symptoms in 1992, and baseline paranoid ideation in 1992.

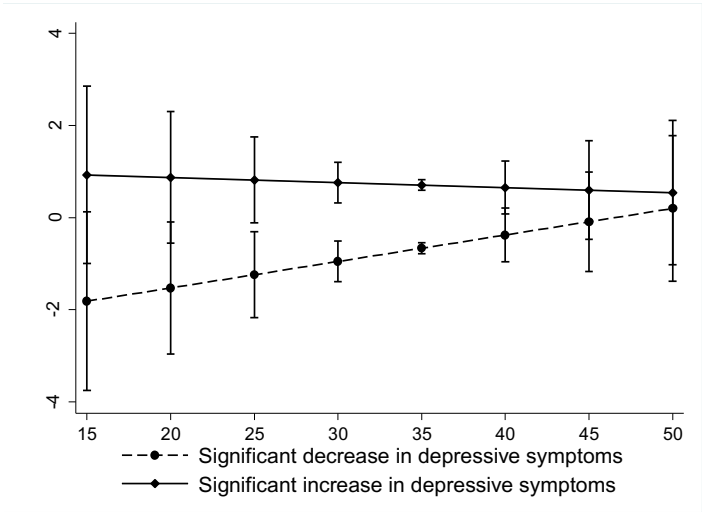


Figure 4. *Predicted change in paranoid ideation over age separately for individuals belonging to the largest 10% in increase and the largest 10% in decrease of depressive symptoms. Predicted means with 95% confidence intervals.*

As supplementary analyses, we investigated the causal relationships between depressive symptoms and paranoid ideation over years 1992, 1997, 2001, 2007, and 2012 using cross-lagged panel design for longitudinal data. Three models were estimated: (1) a model with only stability coefficients (i.e. predictive paths between depressive symptom scores at different timepoints, and predictive paths between paranoid ideation scores at different timepoints) and covariances between depressive symptoms and paranoid ideation at each timepoint (2) a model including also cross-lagged predictive paths from depressive symptoms at each timepoint to paranoid ideation at the following timepoint, and vice versa (constrained to be equal in both directions) (3) a model with the cross-lagged predictive paths freely estimated. Models 2 and 3 had significantly better fit than model 1, suggesting that there were predictive relationships between depressive symptoms and paranoid ideation. Model 2 had good fit, but model 3 had significantly better fit than model 2. Model 3 revealed that there were significant positive predictive associations in both directions, but the predictive coefficients appeared to be stronger from depressive symptoms to paranoid ideation than vice versa. Taken together, the predictive relationship between depressive symptoms and paranoid ideation appeared to more likely to proceed from depressive symptoms to paranoid ideation than in the opposite direction.

5 DISCUSSION

5.1 THE ROLE OF TEMPERAMENT AND CHARACTER FOR THE DEVELOPMENT OF PARANOID IDEATION

The findings of the present study supported the hypothesis about the role of personality dimensions and their profiles on the course of paranoid symptoms in adulthood. Our results demonstrated that single temperament dimensions of high novelty seeking, high harm avoidance and low reward dependence were related to the development of more severe paranoid ideation. This is in accordance with some previously found single-trait correlations between temperament and character (e.g. Bagby et al., 2005; Ha et al., 2007). Moreover, the present study was the first to demonstrate that explosive temperament profile (consisting of high novelty seeking, high harm avoidance, and low reward dependence) was related to higher paranoid ideation. Our findings also revealed that the individual-level variation in the effects of temperament dimensions and their profiles on the development of paranoid ideation was only minor, and the associations were consistent over the 15-year follow-up. Furthermore, there were no interaction effects between age and temperament profiles, which indicates that the influence of temperament on paranoid ideation was of similar magnitude over age in adulthood. Consequently, temperament dimensions appear to represent relatively stable susceptibilities for paranoid ideation.

The present study implies that several of the previously found concomitants of paranoia might actually reflect underlying temperament-based vulnerabilities. Low reward dependence shares some aspects with imprecise perceptions about others' socioemotional cues and attributing negative events to others' hostile intentions, which are linked with higher paranoid features (Bentall et al., 2001; Freeman, 2007). High novelty seeking includes by definition an impulsive cognitive style (Cloninger et al., 1997), which in turn is found to predispose to paranoid symptoms (Freeman et al., 2002). Finally, paranoid beliefs are found to be linked with feelings of distress in ambiguous social situations and higher anticipation of threat (Freeman et al., 2001; Freeman & Garety, 2014; Gaweda et al., 2015; Tone et al., 2011). These qualities may be influenced by high harm avoidance, which is related to manifestations of automatic affective response patterns (Cloninger et al., 1993). Taken together, recognizing the potential temperamental origin of some previously found risk factors might increase the understanding of the psychological etiology of paranoid ideation.

The present study demonstrated that organized characted profile and also single character dimensions of high self-directedness, high cooperativeness, and low self-transcendence were associated with a lower level of paranoid ideation. Previously, it has been found that low self-directedness and low cooperativeness are linked with a variety of psychiatric symptoms (e.g. Cloninger & Zohar, 2011; Jylhä et al., 2013; Švrakić et al., 2002). It has been suggested that immature variants of these

character dimensions may capture some fundamental aspects of personality disorders (Cloninger, 2000). Specifically, personality disorder is defined as an impaired and inflexible personality functioning that is pervasive across a broad range of personal and social situations (APA, 2013). These features correspond relatively closely to the manifestation of low self-directedness and cooperativeness. Moreover, low self-directedness and low cooperativeness may be linked with higher paranoid ideation also indirectly via other psychiatric symptoms. For example, low self-directedness is linked with a lower risk for anxiety (Jylhä & Isometsä, 2006), social phobia (Marteinsdottir et al., 2003), and substance abuse (Le Bon et al., 2004). These psychiatric symptoms, in turn, are suggested to act as predisposing factors for the emergence of paranoid symptoms (Freeman et al., 2002).

Previously, it has been found that high self-transcendence is linked with higher perception of happiness when accompanied with high self-directedness, whereas in combination with low self-directedness, high self-transcendence is related to weaker mental health (Cloninger & Zohar, 2011). In our study, however, high self-transcendence was associated with the development of higher paranoid ideation even when accompanied by high self-directedness. Hence, high self-directedness could not mitigate the link between high self-transcendence and higher paranoid ideation. This adverse effect of high self-transcendence may be specific for paranoia, because high self-transcendence correlates with such personality disorders that commonly contain paranoid beliefs, i.e. schizotypal and borderline personality disorders (APA, 2013; Barnow et al., 2007; Jylhä et al. 2013). Moreover, previous studies have suggested that some concepts relatively close to high self-transcendence, such as intuitive reasoning or intrusive mental imagery, might be linked with paranoid ideation (Freeman et al., 2012a; Schulze et al., 2013).

Overall, our results highlight the protective role of character against the development of paranoid symptoms. After controlling for character dimensions, the associations of temperament dimensions with paranoia almost entirely disappeared, implying that character dimensions mediate the relationship of temperament dimensions with paranoid ideation. Furthermore, even though individuals with explosive temperament had on average higher level of paranoid ideation than subjects with other temperaments, their risk for paranoid symptoms was significantly lower if they had organized character profile. Our findings provide evidence for the previous suggestions that mature and balanced beliefs about the self and others might have a protective influence against the emergence of paranoid symptoms (Bentall et al., 2001; Freeman et al., 2002).

5.2 EXPLOSIVE TEMPERAMENT AND CHARACTER DEVELOPMENT: THE ROLE OF ATTACHMENT SECURITY AND SOCIAL SUPPORT

Study II demonstrated that explosive temperament profile is related to less mature self-directedness and cooperativeness in adulthood. These associations appeared to be

comparatively stable: they were evident over the 15-year follow-up period, their individual-level variation was only minor, and they sustained after controlling for age, gender, and socioeconomic factors in childhood and adulthood. Taken together, Studies I and II suggest that individuals with explosive temperament profile are relatively likely to have less mature self-directedness and cooperativeness and, in that way, a heightened risk for more severe paranoid ideation.

Our findings also revealed that the positive influence of secure attachment and high social support on higher self-directedness and cooperativeness was similar in individuals with explosive temperament and other temperaments. Hence, high social support and secure attachment appeared to ameliorate the unfavorable character development in individuals with explosive temperaments. Nevertheless, even in the presence of high social support and secure attachment, explosive individuals could not reach the average level of self-directedness and cooperativeness of individuals with other temperaments. Our findings are in line with a previous suggestion that especially such temperament profiles, which include conflicting variants of single dimensions, constitute a challenge for character development (Cloninger et al., 1997). By definition, explosive temperament profile consists of a particularly conflicting combination of temperament variants, for example, a low need for others' approval but simultaneously a strong tendency to experience worry in response to signals of punishments (Cloninger et al., 1997).

Studies I and II tentatively suggest a pathway from high social support to more mature character and, in that way, to a lower level of paranoid ideation. This is in accordance with previous findings. It has been found that balanced and non-conflictual social relationships are linked with, for example, higher resourcefulness in stressful situations and a higher capacity to change one's interpersonal schematic beliefs in adaptive ways (Berry & Worthington, 2001; Thoits, 2011). These concomitants of balanced social relationships, in turn, are conceptually close to several dispositions of mature character. For example, high self-directedness includes characteristics such as high resourcefulness and emotional self-regulation (Cloninger et al., 1997). Additionally, the association of higher social support with lower paranoid ideation is plausible in the light of previous findings. It has been suggested that efficient stress coping and high belief flexibility, i.e. concomitants of high social support, act as protective factors against the emergence of paranoid symptoms (Freeman et al., 2002).

Additionally, Studies I and II suggest that in individuals with explosive temperament, secure attachment is linked with higher self-directedness and cooperativeness and, in that way, to a lower risk for paranoid ideation. It has been found also in previous studies that having emotionally close relationships and positive interpersonal self-concepts correlate with a lower level of paranoid features (Lincoln et al., 2010; MacBeth et al., 2010). Secure attachment may also lower the risk for adverse behavioral consequences of paranoid ideation. In the case of interpersonal rejection, dynamic and unstable shifts in insecure attachment configurations may predispose to the emergence of thoughts of revenge and stalking in individuals with paranoid beliefs (Wilson et al., 2006).

5.3 THE CO-OCCURRENCE OF DEPRESSIVE SYMPTOMS WITH PARANOID IDEATION

The present study was the first to explore the co-occurrence of depressive symptoms with paranoid ideation in the general population over age in adulthood, from late adolescence to middle age. It was found that depressive symptoms were linked with the course of higher paranoid ideation, especially in late adolescence and early adulthood. With regard to depressive subsymptoms, high negative attitude and high performance difficulties were associated with more severe paranoid ideation over age, whereas the influence of somatic symptoms became significant only after early adulthood. Furthermore, our results suggested that depressive symptoms were related more strongly to the development of trait- than state-level paranoid ideation. This implies that depression-related paranoid ideation reflects rather a dispositional trait than a state that might disappear rapidly after an acute depressive episode. All the associations sustained after controlling for age, gender, socioeconomic factors in childhood and adulthood, and individual-level variation in the effects of depressive symptoms.

Previous studies have suggested that depressive and paranoid symptoms correlate with some common cognitive styles, such as beliefs about others' negative evaluation toward the self (Martin & Penn, 2001), internal attribution for negative events (Bentall & Kaney, 2005), and expectations that unpleasant events are likely to happen to the self (Corcoran et al., 2006). Our study demonstrated longitudinally that the association of negative attitude (i.e. negative cognition and depressive mood) with paranoid ideation remained highly similar over age, from late adolescence to middle age. Additionally, we found that negative attitude, which reflects the symptoms that are regarded as the core symptoms of depressive disorders (APA, 2013), was associated with paranoid ideation even when controlling for performance difficulties, which are characteristic also for a range of other psychiatric disorders (e.g. Moritz et al., 2002). This implies that the comorbidity between depression and paranoia does not reflect only a general liability to psychiatric disorders, but depressive and paranoid symptoms may possibly include some overlapping cognitive-affective processes. This is in line with a statement of the current psychiatric classification, postulating that depressive disorder commonly manifests as increased hostility toward other people (APA, 2013). That is, paranoid features are regarded as a part of the depressive symptomatology.

Our findings also demonstrated that performance difficulties, i.e. depression-related impaired executive functioning and decreased social activity, were linked with the development of higher paranoid ideation. This is in accordance with an environmental feedback hypothesis (Morse & Lynch, 2004). Based on the hypothesis, lowered social activity and staying away from interpersonal contacts leads to fewer possibilities to receive contradictory evidence for one's paranoid beliefs. Moreover, depression-related impaired executive functioning typically involves a lowered cognitive inhibition (Joormann, 2010). Lowered cognitive inhibition, in turn, is suggested to weaken one's capacity to control arbitrary and unjustified

interpretations about others' intentions and, in that way, to predispose to paranoid thoughts (Freeman et al., 2002).

Recent developmental models of paranoia have postulated that somatic symptoms are linked with paranoid ideation indirectly by predisposing to biases in affective and cognitive processing (Freeman & Garety, 2014). The results of the Study III provided evidence for this hypothesis, since the main effect of somatic complaints on paranoid ideation became nonsignificant after controlling for negative attitude and performance difficulties. Among a variety of somatic complaints, insomnia may have a particular role for the course of paranoid symptoms. Insomnia is suggested to increase the risk for transient deficits in cognitive control and also to predispose to anomalous experiences, which in turn are risk factors for paranoid symptoms (Freeman et al., 2010; Freeman & Garety, 2014).

Over age, however, the influence of somatic complaints became significant. This suggests that after early adulthood, there may exist also a more direct link between somatic complaints and paranoid ideation. This may possibly refer to such a condition that somatic symptoms are interpreted as markers of damage caused by others (APA, 2013). That is, somatic complaints partially comprise the content of paranoid beliefs. The relationship of somatic symptoms with paranoid ideation may become significant later in adulthood, because somatic symptoms are especially typical for late-onset depression (Fiske et al., 2009) and because biased interpretations for mild bodily sensations become more common in older ages (Suvisaari et al., 2009).

A previous study suggested that changes in depressive symptoms may cause changes in paranoid personality features (Fava et al., 2002), implying that depression-related paranoia may not only represent transient state-level changes in the level of paranoid ideation. However, the follow-up period persisted only 8 weeks. Our study with a 20-year follow-up provided new evidence that depressive symptoms are related especially to the course of trait-level paranoid ideation.

Recently, there has been an increasing demand to investigate, which factors might contribute to the emergence of late-onset personality disorder traits (Oltmanns & Balsis, 2011; van Alphen et al., 2015). In Study III, we found that the association of an increase in depressive symptoms with an increase in paranoid ideation weakened over age and appeared to become non-significant in middle age. Hence, our study indicates that at least at subclinical level, the emergence of depressive symptoms in middle age may likely not be related to the emergence of late-onset paranoid features. This is consistent with a meta-analysis concluding that the stability of personality traits reaches a peak in middle age and, thereafter, changes in personality traits become more unlikely (Roberts & DelVecchio, 2000).

Finally, our supplementary analyses suggested that the predictive relationship between depressive symptoms and paranoid ideation is more likely to proceed from depressive symptoms to paranoid ideation than in the opposite direction. However, it may be that the predictive pathway from paranoid ideation to depressive symptoms is stronger in clinical populations including more severe and diagnostically significant levels of paranoid ideation than in our non-clinical sample. Previously, it has been found that especially psychotic-level delusional ideation predicts the development of depressive symptomatology (Birchwood et al., 2000, 2005; Iqbal et

al., 2000; Sullivan et al., 2014). For example, a negative appraisal of one's delusion-related diagnosis may lead to feelings of humiliation, impaired self-esteem, loss of certain occupational positions, interpersonal avoidance, and eventually to depression (Birchwood et al., 2005; Iqbal et al., 2000; Sullivan et al., 2014).

5.4 METHODOLOGICAL CONSIDERATIONS

In Studies I–III, there are several methodological issues that are necessary to take into consideration. First of all, attrition analyses indicated that included participants had on average a lower level of paranoid ideation and also milder depressive symptoms than excluded participants. In studies with long-term follow-ups, it is common that participants with severe psychiatric symptoms drop out from the study (de Graaf et al., 2000; Triebwasser et al., 2013). Subsequently, in our study, depressive symptoms and paranoid ideation may have been mild and subclinical for the most part. Hence, the results cannot be fully generalized to clinical populations. It is possible that the associations found in Studies I–III might have been stronger in clinical populations. Nevertheless, the primary goal of the present study was to explore mild symptoms in order to increase the understanding of subclinical symptomatology and to acquire tools for developing early preventive treatments, as has been recommended earlier (Freeman & Garety, 2014). For this reason, we also used such a measure of depressive symptoms that is shown to be especially applicable to non-clinical populations and to capture sensitively the variation at mild symptom levels (e.g. Katainen et al., 1999; Nurmi et al., 1995; Rosenström et al., 2012).

Related to causality, our supplementary analyses indicate that the association between depressive symptoms and paranoid ideation was more likely to proceed from depressive symptoms to paranoid ideation than vice versa. Also previous studies have suggested that depressive symptoms predict the onset and persistence of paranoid symptoms in adulthood (Fowler et al., 2011; Freeman et al., 2012b). In the other associations that we investigated, causal relationships remain more uncertain. For example, previous studies have demonstrated that specific psychiatric symptoms, such as depressive mood, may be associated with slight state-dependent changes in the manifestation of harm avoidance or self-directedness (Corruble et al., 2002; Spittlehouse et al., 2010). With regard to paranoid symptoms, the evidence of such symptom-induced changes in personality dimensions is lacking, but this possibility cannot be ruled out. The primary aim of the present study, however, was not to discover causal relationships, but to increase the general awareness that there exist associations of personality dimensions and depressive symptoms with paranoid ideation and these associations are evident over long-term follow-ups in adulthood.

There may also have been unexplained variation in the statistical analyses due to confounding variables. For example, specific temperament dimensions are found to correlate with borderline personality disorder (Basoglu et al., 2011; Fassino et al., 2009; Jylhä et al., 2013), which in turn is associated with depressive symptoms and paranoid ideation (APA, 2013). However, our data did not provide possibilities to take into account the features of borderline personality disorder.

Additionally, a range of other risk factors for paranoia were not controlled for in the analyses. For example, physical injuries, anomalous experiences, and certain attribution styles are linked with higher paranoid ideation (D'Souza et al., 2004; Gracie et al., 2007; Langdon et al., 2006; Thewissen et al., 2005), but we could not control for them in the present study. Hence, it remains uncertain, whether the effects of personality dimensions and depressive symptoms on paranoid ideation might remain evident after taking into account other previously found risk factors for paranoid ideation. This is a crucial research question for future studies.

In our study, most study variables were assessed with self-report questionnaires. Hence, the results may have been affected by common methods bias, i.e. some common variance between study variables may be partly accounted by the common measurement method (Gorrell et al., 2011; Podsakoff et al., 2003). In the research field of mental health, the use of self-report questionnaires is highly common, because in many cases one's internal states cannot be accurately measured with other assessment methods (Podsakoff et al., 2003; Spector, 2006). In our statistical analyses, predictive variables included several factors measured with self-rating scales. Previously, this has been found to decrease the magnitude of common methods bias (Siemsen et al., 2010). Moreover, in the present study, most analyses included quadratic slopes or interaction effects, which are shown to be more likely deflated than inflated by the common methods bias (Siemsen et al., 2010). Consequently, the results of the present study may likely not be artifacts of the common methods bias.

Paranoid ideation was measured with the Paranoid Ideation Scale of the SCL-90-R. There are mixed views about the factor structure and construct validity of the SCL-90-R (e.g. Olsen et al., 2004; Schmitz et al., 2000; Tomioka et al, 2008; Urban et al., 2014). Nevertheless, the Paranoid Ideation Scale has been widely used in recent psychiatric studies (e.g. Chen et al., 2014; Fagnani et al., 2011). Generally, the investigation of paranoid symptoms is found to be highly challenging. One essential reason for this is the paranoia-related suspiciousness and distrustfulness toward researchers, which is noted to substantially decrease the willingness to participate in any studies (Triebwasser et al., 2013). The present study opens the research field of investigating the development of paranoid ideation in adulthood over a long-term follow-up. Future studies could continue this work by using more thorough assessment methods of paranoid ideation, for example, psychiatric interviews conducted by mental health workers or more detailed symptom questionnaires. Especially, it might be beneficial to consider also the degree of conviction and distress related to paranoid ideation, which are linked to the prognosis of patients with paranoid beliefs (Freeman et al. 2005).

In the present study, explosive temperament profile was defined with a median-split method. This method has been used also previously (Hintsanen et al., 2012; Josefsson et al., 2011b). It might be argued, however, that the utilization of profiles may have caused unnecessary classification of participants. Nevertheless, there is evidence that using this kind of profiles is an optimal procedure to recognize patterns in the psychiatric research field (Arnedo et al., 2015). Additionally, the use of profiles captures personality multidimensionally, which is essential from the theoretical viewpoint (Cloninger et al., 1997).

Based on reliability analyses, Cronbach's alpha for the somatic complaints scale of the mBDI was low in year 1992 measurement point. The removal of any single item would not have improved the internal consistency of the scale substantially. Consequently, the findings about the association of depressive-related somatic complaints with paranoid ideation must be interpreted cautiously. Nevertheless, our further investigation revealed that each item of the scale correlated with a magnitude of 0.5 or more with the overall mean of somatic complaints scale in 1992. This implied that the scale had acceptable internal consistency also in 1992. The low value of Cronbach's alpha is likely accounted by the fact that depressive disorders contain highly heterogeneous profiles of somatic complaints (Fried & Nesse, 2015). There is evidence that distinct somatic symptoms may include changes even in reverse directions (Kapfhammer, 2006), for instance, increased need for sleep but decreased appetite.

Finally, this study had also a range of substantial strengths. Firstly, this study adopted a continuum-based viewpoint on paranoid ideation that has been called for previously (e.g. Freeman & Garety, 2014). That is, our study investigated paranoid ideation as a continuous dimension ranging from mild and subclinical paranoid thoughts to severe paranoid ideation. Previously, the weaknesses of diagnostic categorization have been widely recognized (Dixon-Gordon et al., 2011; First, 2005). For example, even severe and distressing paranoid symptoms may remain unrecognized if they do not fulfill all necessary diagnostic criteria. Our findings, however, were not restricted by diagnostic categorization and provided information also about subclinical paranoid ideation.

Moreover, our data provided unique possibilities to investigate the development of paranoid ideation over a 20-year follow-up including five measurement points. To our knowledge, no previous study has examined the development of paranoid ideation over such a long-term follow-up period in adulthood. Moreover, also the predictive factors of paranoid ideation were measured over exceptionally long follow-up periods. Specifically, depressive symptoms were assessed at five time points over a 20-year follow-up, and personality dimensions, social support, and attachment security were evaluated at several assessment points over a 15-year follow-up. The long follow-up periods enabled us to examine whether the associations were consistent over age and also to capture developmental trait-level changes in paranoid ideation, which has been called for previously (Corcoran et al., 2006). Furthermore, we could control for a variety of potential sociodemographic confounding variables, including socioeconomic factors in childhood and adulthood. The use of multilevel models increased the statistical power of our analyses and enabled us to consider both the classic regression coefficients and also individual-level variation in the effects of predictive variables. That is, we could evaluate how stable the obtained associations were at the individual level.

We also had relatively large population-based samples, which included over 2000 participants in Studies I–III. Despite some degree of selective attrition over the follow-up, the samples were likely to represent the general population with regard to most sociodemographic characteristics. Additionally, the participants were selected from six different age cohorts, which extended the age range of the sample and enabled

to examine the course of paranoid ideation from age 15 to 50, i.e. from late adolescence to middle age. Overall, our data provided unique possibilities to investigate the psychological etiology of paranoid ideation in adulthood.

5.5 CLINICAL IMPLICATIONS

Studies I–III have several implications for the clinical work in mental health services. Previously, there has been a concern that there does not exist any established treatment program for paranoid symptoms (Dixon-Gordon et al., 2011). Paranoid patients have been provided with a variety of different interventions that appear to be relatively ineffective (e.g. Dixon-Gordon et al., 2011; Karterud et al., 2003; Schneider & Klauer, 2001).

5.5.1 PERSONALITY DIMENSIONS AND PARANOID IDEATION

Interventions for paranoid ideation might be tailored on the basis of the staging model (McGorry et al., 2006). The staging model postulates that each individual can be placed at one point on the paranoia continuum, ranging from mild and subclinical paranoid ideas to severe paranoid symptoms. Moreover, each individual may also proceed toward the milder or more severe end of the continuum over time. Hence, a clinician could recognize one's current stage of paranoid ideation and provide such an intervention that might prevent one's progression toward a more severe stage of paranoia. This staging model could improve the content and timing of interventions for paranoid ideation. Specifically, based on the current severity of one's paranoid ideation, a clinician could provide a primary, secondary, or tertiary intervention (McGorry et al., 2006).

Primary interventions could be provided for relatively mild paranoid ideas that are not persistent and that one is not very convinced about (McGorry et al., 2006). Primary interventions could focus on investigating which psychosocial factors might prevent one's proceeding toward a more severe level of paranoid ideation in each individual case. Previous studies have suggested that clinicians could, for example, focus on the role of stressful events, quality of interpersonal relationships, and substance use on paranoid ideation (D'Souza et al., 2004; Freeman & Fowler, 2009; Gracie et al., 2007; Lopes, 2013).

Our findings provide evidence for primary interventions that focus on the role of personality dimensions for paranoid ideation. Primary interventions could support the self-regulation of temperamental vulnerabilities by developing high self-directedness and cooperativeness, i.e. internalizing more mature and balanced concepts about the self and interpersonal relationships. Our findings suggest that in individuals with explosive temperament, secure attachment and higher social support have a favorable influence on the development of higher self-directedness and cooperativeness, which in turn have a protective role against paranoid ideation. Hence,

psychotherapeutic treatments could enhance explosive individuals' ability to form confidential and supportive relationships. Based on previous suggestions (Cloninger, 2002), explosive individuals might benefit from meta-cognitive training as well as relaxation exercises that could increase their self-acceptance and self-regulation of affective instability. Moreover, dialectical behavior therapy is tailored for patients characterized especially by a marked reactivity of mood, intense and labile affects, impulsive aggression, and attachment-related disturbances (Robins & Rosenthal, 2011). Hence, in some cases, dialectical behavior therapy might be effective for individuals with explosive temperaments.

When designing treatment programs for alleviating paranoid symptoms, it should also be taken into consideration that high self-transcendence may predispose to the development of paranoid ideation. Especially, mindfulness exercises and meditation training aim to enhance imaginatory processes and intuitive reasoning (Greenberg & Mitra, 2015; Ospina et al., 2007), which are partly overlapping concepts with high self-transcendence (Cloninger et al., 1997). There exist single reports even about meditation-induced paranoid psychoses (e.g. Kuijpers et al., 2007). Hence, among individuals with paranoid symptoms, the use of such treatments programs that promote the development of high self-transcendence should be carefully considered.

Secondary interventions could be provided for more severe paranoid beliefs that are experienced as distressing and cause decline in functioning (McGorry et al., 2006). Such individuals might benefit from cognitive-behavioral therapy with a comparatively specific focus on the content of paranoid ideation (McGorry et al., 2006). Previous studies have suggested that cognitive therapy might focus on, for example, negative metacognitive beliefs about the self and paranoid thoughts and executive control over attention (Morrison et al., 2007; Sellers et al., 2017). Moreover, clinicians could consider potential feelings of humiliation and entrapment (Birchwood, 1999). Our findings tentatively suggest that considering temperament dimensions might help clinicians to identify the potential origins of certain cognitive schemas. Specifically, temperament dimensions are postulated to direct one's perception, attention, and memory (Cloninger et al., 1997) and, in that way, to influence the development of cognitive schemas.

On the basis of the staging model, tertiary interventions could be provided for individuals with psychotic-level persecutory delusions (McGorry et al., 2006). There is evidence that persecutory delusions are associated with a wide variety of neurochemical disturbances (e.g. Howes et al., 2017; Kapur et al., 2005; Smieskova et al., 2010) and are commonly triggered by increased levels of stress (e.g. Myin-Germeys & Van Os, 2007; Van Winkel et al., 2008). Hence, in that level of symptomatology, pharmacological treatments and community-based interventions reducing the level of stress are regarded as primary treatments (APA, 2013; McGorry et al., 2006). There are, however, hopeful findings that cognitive psychotherapy might be effective also for individuals with psychotic-level delusions (Lincoln et al., 2012; Sivec & Montesano, 2012; Turner et al., 2014). Hence, future studies could further investigate the role of personality dimensions in clinical populations and among individuals with psychotic persecutory delusions.

5.5.2 DEPRESSIVE SYMPTOMS AND PARANOID IDEATION

Our study also provides new evidence to develop more effective interventions for patients with co-occurring depressive and paranoid symptoms, who are noted to constitute a relatively treatment-resistant patient population (e.g. Bockian, 2006; Dixon-Gordon et al., 2011; Karterud et al., 2003; Mrazek et al., 2014). Patients with paranoid beliefs could benefit from evaluation of potential depressive symptoms, especially negative attitude and performance difficulties. This may be particularly important in late adolescence and early adulthood, when the relationship of depressive symptoms with paranoid ideation is especially evident. Among patients with co-occurring depressive symptoms and paranoid ideation, there may exist a considerable need for neurocognitive rehabilitation, social skills training as well as community-based treatments in order to enhance interpersonal activities and metacognitive skills. Moreover, when planning treatments for middle-aged patients, it is essential to screen for somatic complaints, so that potential direct or indirect pathways from somatic complaints to paranoid ideation might be identified. Overall, our results are in line with previous reviews suggesting that the treatment of depressive symptoms might capture also a variety of the predisposing and maintaining factors for paranoid ideation (Freeman & Garety, 2014; Lake, 2008).

Our study may also have diagnostic implications for mental health care workers, when encountering patients with co-occurring depressive symptoms and paranoid ideation. A concern has been expressed whether recording state-level comorbidities of psychiatric symptoms might, in some cases, cause short-term instability in diagnostic processes (Widiger & Samuel, 2005). However, our study indicated that at least at mild levels of symptoms, this concern may not be justifiable. Specifically, depressive symptoms appeared to be more strongly associated with trait- than state-level paranoid ideation, so that paranoid ideas may not likely to disappear immediately after an acute depressive episode.

In the current psychiatric classification, paranoid personality disorder is not included in cluster B or C personality disorders that are defined as including emotional unstability and anxiety (APA, 2013). Previous studies have demonstrated that the predictive and construct validity of personality disorder clusters is questionable at clinical levels of symptomatology (e.g. Sheets & Craighead, 2007; Tyrer et al., 2015). Our study in a non-clinical population implies that the validity of personality disorder clusters may not be justified either at subclinical levels of symptoms. For example, depressive symptoms (i.e. sad mood, irritability, and despair) and high harm avoidance (i.e. high tendency to experience worry, fear, and distress) were closely linked to higher paranoid ideation. The potential contribution of internalizing affective processes to paranoid ideation needs to be considered, when tailoring treatments for individuals with paranoid symptoms in mental health care services.

Currently, there is a substantial stigma related to paranoid personality disorder, stronger than to a variety of other mental disorders (Celaire & McDermott, 2015). Stigmatization, in turn, is found to be related to social avoidance, impaired functioning in close interpersonal relationships, higher depressive mood, and

eventually also higher levels of suspiciousness and hostility (Pachankis, 2007). Hence, stigmatization may indirectly create additional maintaining factors for paranoid beliefs and, therefore, weaken the prognosis of individuals with paranoid symptoms. Our results indicate that a fairly large percentage of individuals in the general population have susceptibilities for the development of paranoid ideation. Specifically, the prevalence of explosive temperament profile was about 8–9% in our population-based data, and the 12-month prevalence of major depressive episode is estimated to be about 10% in the Finnish population (Lindeman et al., 2000). Consequently, the psychological etiology of paranoid ideation includes factors that are highly common in the general population. The findings of the present study will probably reduce the stigmatization related to paranoid ideation.

5.6 CONCLUSIONS

This study suggested that specific variants of temperament dimensions and profiles represent susceptibilities for paranoid ideation in adulthood. Nevertheless, the presence of supportive and confidential interpersonal relationships is linked with more mature personalities, i.e. high self-directedness and high cooperativeness, which in turn appear to have a protective role against paranoid ideation in individuals with temperament-related susceptibilities. Moreover, this study indicates that the co-occurrence between depressive symptoms and paranoid ideation is especially evident in late adolescence and early adulthood. The contribution of affective processes, whether related to temperament dimensions or depressive symptoms, to the course of paranoid ideation needs to be taken into consideration, when developing psychotherapeutic interventions for individuals with paranoid ideation

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